THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXXXV. No. 2125.] LONDON, FEBRUARY 2, 1904. [56TH YEAR. PRICE 6d.

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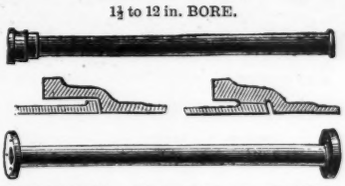

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The following Town Water-Works Supplies have been obtained by this System, viz.:—Abbott's Langley, Aldershot, Alnwick, Cirencester, Hertford, Lechlade, St. Albans, Shrewsbury, Skegness, Southampton, Stony Stratford, Swansea, Wallingford, Watford, West Worthing, Wimborne, &c.

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RETORT SCURFER

Saves its Cost many times each Year.

TESTIMONIAL.

WRITE FOR FULL PARTICULARS.

RESULTS GUARANTEED.

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We have now had your Retort Scurfer at these Works for over Twelve Months, and having tried several forms of de-scurfing Retorts, we have no hesitation in saying that it is by far the best Apparatus we have tried for this purpose. **Two men have several times drawn a Setting of Seven Retorts, thoroughly cleaned the same, and charged the Retorts again within 6½ hours.** As a matter of fact, it is unnecessary for a Retort to be out of use more than 40 minutes for scurfing purposes if your apparatus is used.

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Please apply for Catalogue No. 8.

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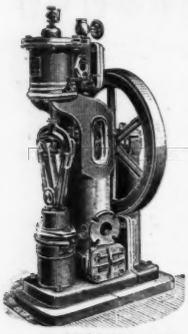

Fig. 705. "SINGLE RAM" STEAM-PUMP.

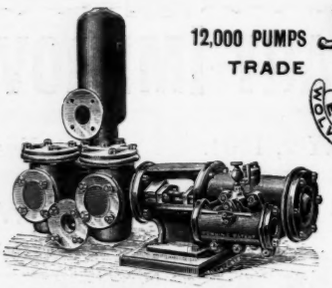

Fig. 598. "CORNISH" STEAM-PUMP FOR BOILER FEEDING, &c.

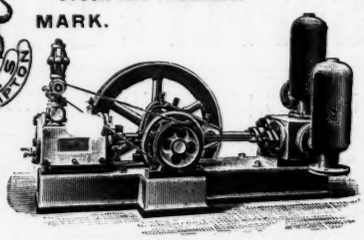

Fig. 685. "RELIABLE" STEAM-PUMP FOR TAR AND THICK FLUIDS.

Fig. 712. "DOUBLE-RAM" STEAM-PUMP.

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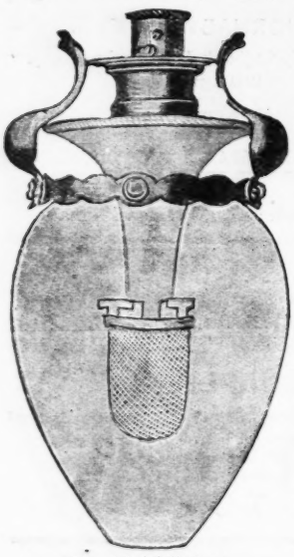
PATENT INVERTED INCANDESCENT GAS-BURNERS.



One-third full size.
Price: Burner with Mantle, **6/6.**
Globes from **8d.** each.

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The most up-to-date and economical system of gas lighting, artistic in appearance and absolutely shadowless, and readily attached to existing fittings.

A BRILLIANT WHITE LIGHT OF 65 STANDARD CANDLE POWER.

Gas Consumption only 3 cubic feet per hour.

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Is the nearest approach to Electric Light, and lends itself more than any other gas-burner to private house lighting, having an exceedingly pretty effect when fixed in clusters of 2, 3, or 5 lights.

20 standard candle power.

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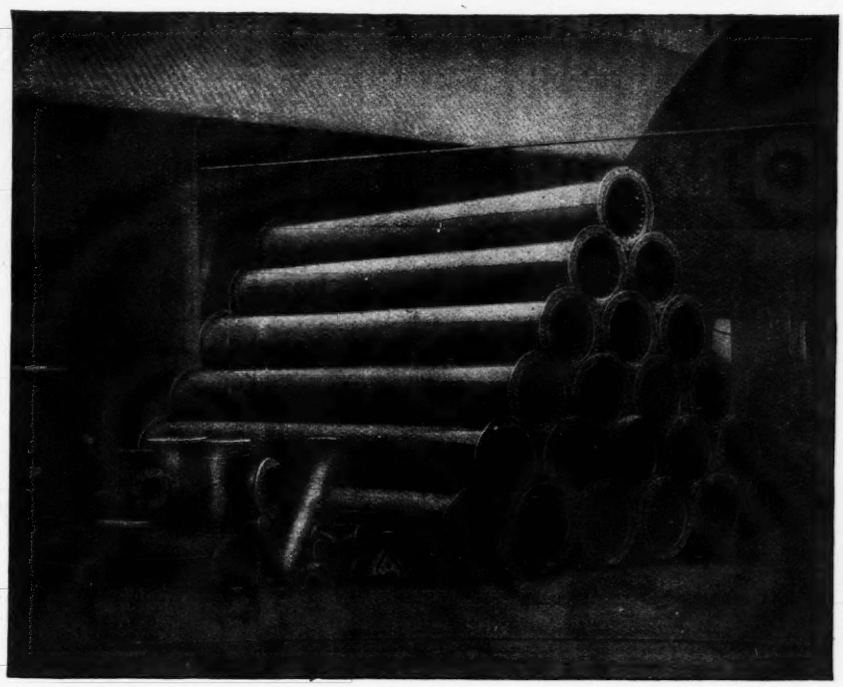

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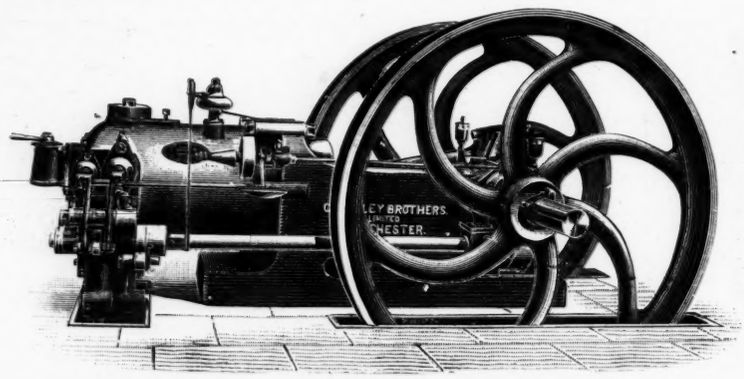

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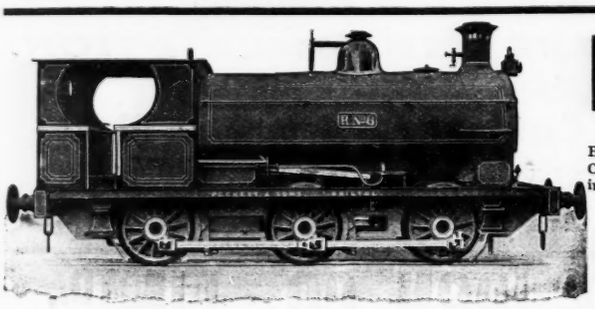

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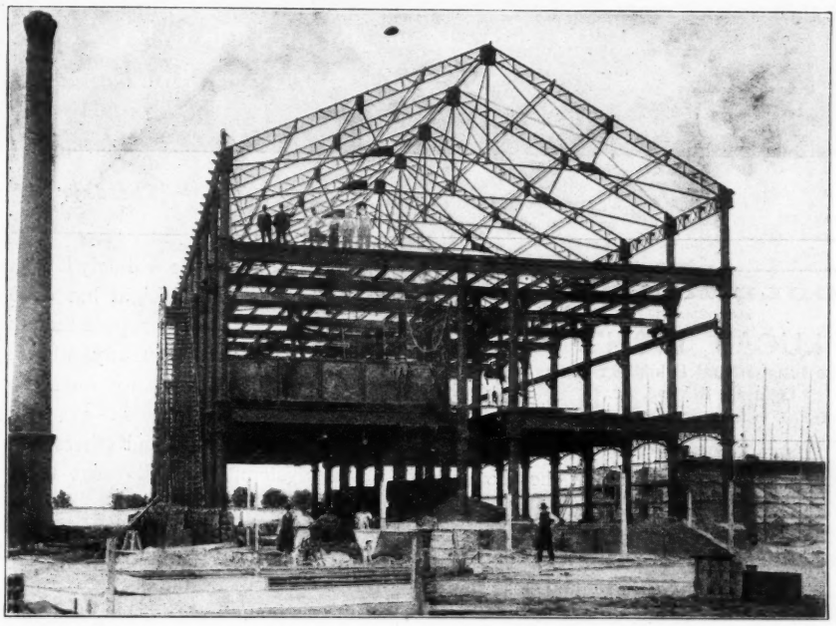

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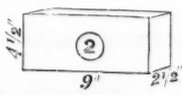

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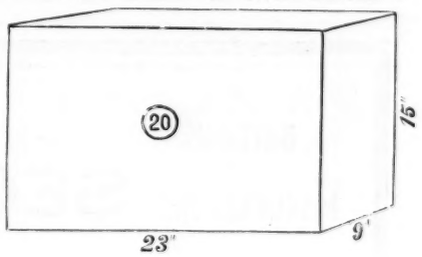

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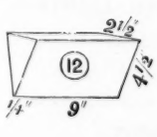

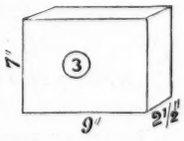

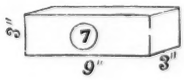

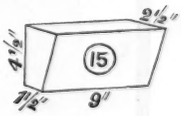

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GAS MANTLE
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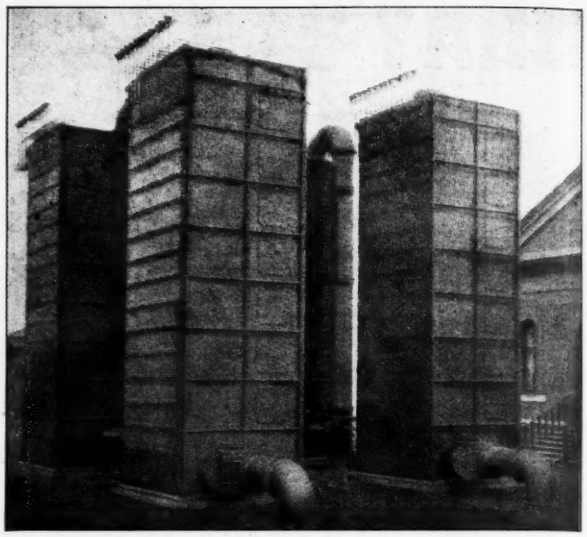

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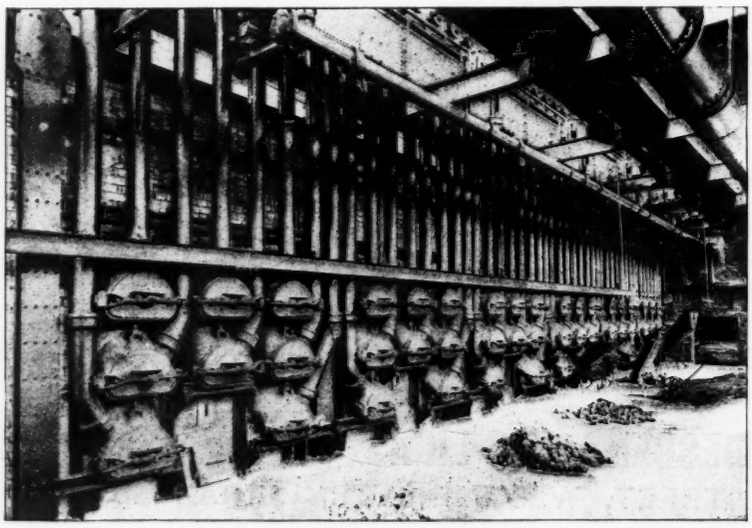

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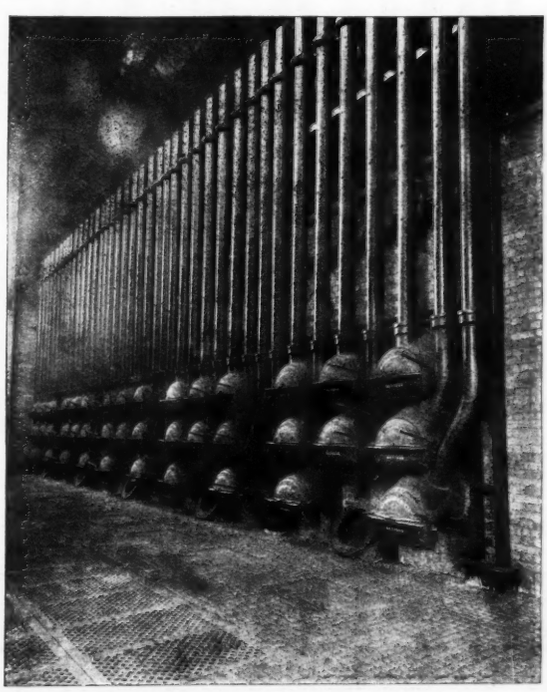

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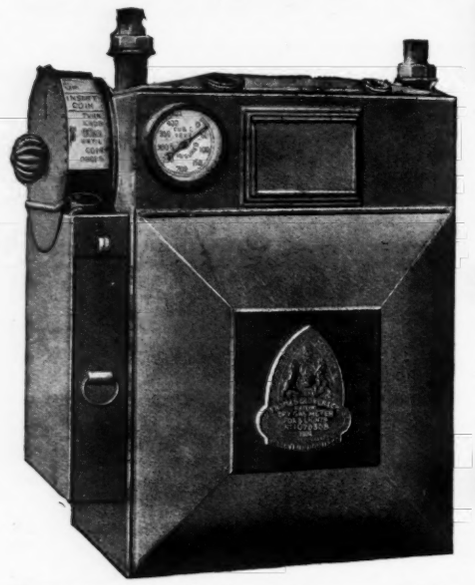

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EDITORIAL NOTES—GAS, &c.

The Board of Trade Committee on London Gas.

As will be seen by the official communication published in another column, the Departmental Committee of the Board of Trade on questions relating to the quality and testing of London gas has been appointed. As was understood some time ago would be the case, Lord Rayleigh, F.R.S., the Chief Gas Examiner for the Metropolis, is Chairman of the Committee—as might be said, by virtue of his office. As it is his fiat which sets in motion the penal procedure of the Acts regulating the testing of London gas, it is necessary that he should supervise anything that may be deemed expedient by way of modernizing these old provisions. It would be neither fitting nor gracious to canvass the qualifications of the members of the Committee for the responsible, and it is to be feared tedious, duty they have undertaken in the public interest. Enough to say that there is not one of them who is unfitted in any sense for the task; though it would be affectation to pretend that the composition of the Committee, taken as a whole, is of an ideal character. Let us point out at once that there appears to be too much of the purely scientific element in this collection of notables, and not enough of the practical, gas engineering component of any really satisfactory tribunal of the kind, the necessity of which was recognized by the (since ignored) statutory description of the Metropolitan Gas Referees. Mr. William King is a strong man, well armed with all technical knowledge; but he will be alone. It is something to be distinctly thankful for that there is no chemist on the Committee. Chemistry is a fine science, no doubt; but it is a notorious weakness of chemists to be unscientific. If we refrain from discussing the personal composition of the Committee, and only lightly pass in review the professions of the members who will have to exercise functions of a judicial cast, we may at any rate offer some candid remarks upon a profession not represented on it. Few gas engineers, it is quite certain, would be found to disagree with the general observation that the interference of chemists with matters of gas testing has had results more meticulous than meritorious. The withers of nobody on the Committee will be wrung by this remark; for the noble Chairman, Sir William de W. Abney, and Dr. Farquharson, while well up in chemical knowledge, are not professed chemists. Physical science, hygiene, law, and gas manufacture are the specialities distinguished by Mr. Gerald Balfour's selection; and they will all find much exercise before the labours of the Committee are ended.

The terms of the reference are explicit. The Committee is charged "to inquire and report (*a*) as to the statutory "requirements relating to the illuminating power and purity "of gas supplied by the Metropolitan Gas Companies; and "(*b*) as to the methods now adopted for testing the same; "and (*c*) whether any alteration is desirable in such require-"ments or method; and (*d*) if so, whether any consequential "alteration should be made in the standard price of gas." This programme is extraordinarily clear and precise. It completely covers the ground which, it is well to remember, was marked out for the inquiry by the proceedings of the London County Council and the Gas Referees in respect to the three London Companies, whose affairs have been before Parliament during the past three years. The main interest in the investigation centres, of course, in the latter half of the reference. Seeing that upwards of 25 years have elapsed since any fundamental revision of the matters embraced in these directions took place, it cannot be justly remarked that the contemplated inquiry is uncalled for. The subjects it will deal with touch closely the commercial and domestic interests of the largest town population in the universe; and they are not without some bearing upon the health of the inhabitants of what is, and has for many years been, the healthiest of the capital cities of the world. It has also the cheapest gas, and the highest gas consumption per head. The last facts go to show that there cannot have been much amiss with the past settlements of the various questions arising out of a Metropolitan Gas Supply; so that the Committee, who will have all the facts of the case laid before them in response to the directions contained in the first half of their reference, will be thereby properly guided as to their attitude in regard to the remainder.

It is reassuring to reflect, moreover, that the appointment of the Committee is not an outcome of any so-called "gas "agitation," such as that which produced the Powers of Charge Committee. It is to their credit that some of the London newspapers that have noticed Lord Rayleigh's new appointment, have also acknowledged the importance of the business the famous discoverer of argon has taken in hand. There will not be, however, any of the arguing to a foregone conclusion that is inseparable from a presumably impartial investigation of a matter that has already been judged before the tribunal of public opinion. At the present moment there are no "sides" to the questions left to the Committee. The Gas Companies immediately concerned now actually follow different practices in regard to the illuminating power of the gas they supply, although as regards purification they all conform to the same standard. Consequently, there is no Gas Companies' policy at stake, one way or the other. It will not be a case of all the gas interest and expert knowledge pulling one way, and the representatives of an angry public pulling against them. Hence there is all the more reason to hope that the outcome of the inquiry may be in accordance with the established facts, and that whatever recommendations the Committee may agree upon will be acceptable to the Companies, and agreeable to the best interests of the Metropolitan population. For there is no doubt whatever that, comparatively large per head as the gas consumption of London is, it is far below what it might and probably would be, if all the people who would benefit by the use of gas for every purpose it can properly perform, realized their advantages in this regard. This they will be all the more likely to do, if they can receive the assurance of Lord Rayleigh's Committee that the interest of the public and that of the Companies in the cheapening and improvement of the gas supply in accordance with modern standards, is one and the same, and that no removable obstacles shall be permitted to stand in the way of the fullest possible use and enjoyment by the public of all the benefits the Companies can procure by the advantages of their position for sharing with their customers.

The Affairs of the Gaslight and Coke Company.

THE Directors' report and the statement of accounts relating to the working of the Gaslight and Coke Company for the past half year have been issued, and will be found in another column. The dividend announcement has already been published, to the effect that, after providing for the fixed charges, there remained a balance available for distribution of £510,767, including the amount brought forward. Out of this sum, the Directors recommend the payment of a dividend on the ordinary stock at the rate of £4 8s. per cent. per annum, which will absorb £335,350 and leave £175,417 to be carried forward to the credit of the current half year. The dividend paid for the corresponding period of 1902 was at the same rate, and the amount then carried forward was £65,146. The profit balance has therefore improved by £110,271, which is a striking illustration of the magnitude likely to be assumed in the accounts by the apparently insignificant fluctuations in value which this immense concern experiences in common with others. The differences in the revenue account contributing to this result are scattered over all the entries on both sides. A saving of £37,549 in the cost of coal was a good help in this direction, and was seconded by improved returns for residuals. On the other hand, the further decrease in consumption, by ¾ per cent., makes itself felt. Evidently the Company have not yet touched bottom in this respect. The reaction must set in sooner or later; the most satisfactory assurance of this being the continuous and substantial increase in the numbers both of consumers and stoves. Still, meanwhile, the undertaking

has to do a good deal of "marking time," with what patience the responsible officers can muster for the exercise. For the first time within living memory, nothing was spent during the half year on new and additional works. The new distributing plant made up for this; being answerable for the expenditure of £95,135, which is a good round sum. There can be no doubt that the energies of the Company should, for the time being, be concentrated upon this department of the undertaking. There is really little else of any importance to occupy the attention of the Board and the chief officers. A lull has set in as regards the political concerns of the Company; so that they are now left absolutely free to "cultivate their garden."

The accounts indicate some interesting matters which are not mentioned in the report. More coal was carbonized than during the corresponding period of 1902, though less gas was made. The difference amounts to 3000 tons—a mere trifle, of course, to this large Company; but the consumption of oil shows a falling off of 500,000 gallons. It is remarked in the report that coal was cheaper; but the same is not said of oil, which is known to have risen in value. Consequently, apparently, the carburetted water-gas plant has been less used. This also appears from the small increase of about £1300 in carbonizing wages. This is not much; but it agrees with the larger consumption of coal. The Company still carbonize a small proportion of cannel, perhaps for the sake of keeping the trade open. One would like to see a still greater impression made upon the labour costs by the extensive machinery which has been going into the different works of the Company for so many years past; though it is only right to point out that great economies have been effected since 1896, when the gas output was about the same in quantity. The carbonizing wages of that year amounted to £357,341; last year they were only £284,382. The outstanding balance of the fittings account for the automatic meter supplies has been further reduced to £104,238. Altogether, the circumstances of the Company are improved and improving, with the single exception of the demand for gas, which, as already remarked, continues to shrink.

Report and Accounts of the South Metropolitan Gas Company.

THE report and accounts of the South Metropolitan Company for the past half year will be found in another column. The former is fuller even than customary; being almost a treatise on the actual condition of the gas industry, punctuated with facts and figures from the recent experience of the Company. The report mentions, and gives the briefest possible reasons for, the reduction made in the price of gas by 2d. per 1000 cubic feet as from Christmas. This leads up to a statement of the various uses to which gas is now put, which, as they mostly involve the employment of the bunsen burner, take no heed of mere luminosity. The deduction drawn from all these observations is that cheap gas is the great *desideratum* for the modern service of towns and cities, the price to be "something below 2s. per 1000 cubic feet." This should be supplied by the existing Gas Companies. Here the report suddenly breaks off treating of generalities, to make a short statement concerning the working of the Company's newly-acquired tar-works, which are doing well. This is also reported of the co-partnership scheme, by which name the profit-sharing system will henceforth be known. The rate of dividend recommended is £5 6s. 8d. per cent. per annum; being the same as for the previous three half years, and the full dividend to which the shareholders are entitled under the sliding-scale. This leaves £55,400 to carry forward; and all the savings funds are well stored, if not plethoric.

The accounts do not call for any detailed criticism. The capital expenditure for the half year was swollen by £80,000, the price of the tar-works. In the revenue account, the returns for gas sold stand at £653,112, as compared with £632,723 for the corresponding half of 1902, with the same selling price of 2s. 3d. per 1000 cubic feet. The increase in gas consumption, accounted for, was 2¾ per cent. There is no arrestation of the growing use of gas for public lighting. It is recorded that of the public lamps served by the Company, 19,776 are incandescent and 2459 flat-flame burners. This statement of the extent of the two kinds of lighting was first made last August. Of course, the tale of meters, stoves, and gas-fires at rent is bigger than ever. Residuals, also improved from £245,948 to £274,470. On the other side of the account, gas manufacture cost less—£541,650 against £544,165. The improvement was, of course, due to cheaper coal; expenses of repairs and maintenance being higher. Co-partnership stands in the account for £16,000. Distribution cost much more; the opportunity of the concern being in funds having evidently been taken to put the house in order throughout. Even so, the balance carried to net revenue account was £22,000 more. Truly, a handsome statement, fully explaining the reduction in price to the lowest figure ever charged by the Company, on the face of it, though no lower than the previous minimum if account is taken of the 2d. per 1000 cubic feet represented by the reduction in illuminating power. This means, as the report states, £96,000 a year, which is twice as much as the Company know how to save, at present, in working expenses under the reduced standard. Really, therefore, they are £48,000 worse off by this relaxation. It so happens that they can afford it; but the same condition might not exist everywhere. Even Sir George Livesey might hesitate to carry the reduction of illuminating power farther, at this price.

The Commissioners of Customs and Incandescent Gas Mantles.

NOT by any means before things had come to a pass that demanded it, the Commissioners of His Majesty's Customs have taken a step which, it is hoped, will put an end to the fraudulent practices which have grown to such large proportions of late years, of bringing over to this country inferior made mantles and what are known in the trade as "seconds" and palming them off as the manufactures of well-known English and other makers. The setting in motion of the ordinary legal machinery, and the infliction of penalties, have not succeeded in putting a stop to these artifices. It will be within the recollection of readers that some time since both the Welsbach and the Guaranty Companies took proceedings against, and obtained the conviction of, certain persons who were engaged in this traffic; but the deception of the public in this way has been so easy, and the result apparently so lucrative to the tricksters, that those who have been—only for a time we trust—fortunate enough not to have been captured at their underhand work have simply treated with derision the examples made of those who, from their point of view, were less fortunate.

The *modus operandi* of those engaged in this nefarious trade is to purchase large quantities of inferior mantles, contained in the ordinary cylindrical cardboard boxes. To comply with the provisions of the Merchandise Marks Act of 1887, the cases themselves or the labels have carried an inscription indicating the country of their manufacture, such as "Made "in ———." That this has been insufficient to prevent the public being deceived into buying mantles purporting to be, but which were not, of English manufacture is proved by what has occurred. It has been one of the softest things in the world to evade the intentions of the Act. The declaration "Made in ———" may, for, instance, have been stamped on the lid of the case; it has been an easy matter to replace the lid with a plain one, or to mask the inscription with a label. If the words have appeared in small type on the edge of the label, it has been a simple thing to arrange for that edge to be non-adhesive so as to secure the ready removal of the certificate of birth. But the tricksters have not stopped there. Good imitations—so good that they have almost defied detection—of the labels and instructions of well-known English and other makers have been printed abroad; and these inferior mantles have been launched on to the British market under reputable guise and name. One of these label infringements which we lately saw was only distinguishable from a genuine Welsbach label by a single letter differing slightly in character from the original. It is bad enough to have England made the dumping-ground of rubbish of the kind; but such base deception and injury to honest trading are more than can be tamely endured. The evil done by such practices does not end with the cheating of the portion of the public who prefer home-made productions into the belief that they are, by their purchase, encouraging British enterprise and upholding their own country's labour, but the vile mantles must do infinite harm to the reputation and business—not only present but future—of those mantle makers whose trade marks, names, labels, and so forth are copied. From the

commercial point of view, we regard the latter as the worse of the issues of this corrupt business; and, looking to the ulterior effects, it cannot profit the gas industry.

However, the difficulty has been to run to earth the people engaged in the sale of these spurious mantles; but in the few cases where success has attended the endeavours, the magistrates have shown their sense of the gravity of the offence. This, however, has not been sufficient. The traffic has continued, and has broken out in fresh places. The Commissioners of Customs have now put out their hand against these dishonest doings and in the defence of fair trade. They have decreed that the mere appearance on labels or boxes in which mantles are encased of the designation required under the Merchandise Marks Act as to the country of manufacture will not henceforth be sufficient, but the notification must be printed on the mantles themselves, in the same manner that many makers now stamp upon them their trade names. If marking is for the future insisted upon of a character that cannot be obliterated or removed by an insignificant shortening of the mantle, it will be the first step towards crushing this new form of commercial swindling. It is obvious that the protection thus afforded will work more to the advantage of the home makers of mantles than to those who import the produce of other countries, and successfully compete for business without resorting to the low form of dishonesty against which it has become necessary to take this measure. Nevertheless it is equally manifest that, if the new rule of the Customs House authorities prove effectual, then the latter must also benefit in a degree by the suppression of the surreptitious and illegal acts, which cannot have failed in depriving them of a portion of business. An impress notifying the source of production will not have the effect of stopping the sale of an article that is both good and cheap.

Payment of Maximum Dividends Free of Income-Tax.

In view of the importance of the issue to Gas Companies, we give in our "Legal Intelligence" to-day a verbatim report of the considered judgment in the case of *The Attorney-General v. The Ashton Gas Company*, which was before Mr. Justice Buckley on the 20th ult. This action was brought, at the instigation of the Corporation of Ashton-under-Lyne, for a declaration that the dividends paid by the Company ought not to be free of income-tax. It is scarcely too much to say that general surprise will be felt among readers of these lines that such a question should be raised in these days, when the practice of deducting the income-tax from statutory dividends is followed by almost every gas company. We should have written every company, but for this example of the opposite practice. As a matter of fact and of custom, however, the Ashton Company have been in the habit of paying their maximum sliding-scale dividend free of income-tax. The Ashton Corporation raised the question whether this is not a payment in excess of that allowed by the Act. The point was justly classified by his Lordship as the simplest possible; and—but for the difficult character of some of the provisions of the Income-Tax Acts bearing upon it—it would not bear very much argument. Supposing, for example, that the maximum rate of dividend permitted to be paid under a gas company's Act is 10 per cent., and that this is paid without deduction of the income-tax paid upon it by the company, this really means more than 10 per cent. The Company in the present case argued that, inasmuch as they are charged income-tax on all their profits, under Schedule A, what remains after making this payment is the profit balance which they are entitled to distribute as maximum dividends. This argument, said the Judge, rests upon a fallacy. The income-tax is not a working expense which has to be borne whether or not profits are earned, but is a part of such profits themselves, whatever their amount. The income-tax has to be paid on all income, but not twice over. If it is paid once by the Company under Schedule A, it has not to be paid again by the recipient of profit, under Schedule D. The Income-Tax Act of 1842 provides the machinery whereby this kind of income is taxed at its source. The receiver of the dividend is to allow the deduction for tax. A loophole for another construction of the law is left by the drafting of the two operative sections of the Act of 1842, in which different collections of nouns are employed. The Judge overruled this point, and declared that a dividend paid free of income-tax is a dividend in excess of the nominal rate; so that if the dividend so paid is the maximum allowed by law, the law is broken.

The Question-Box:

Reference was made in the "Journal" last April to the formation of a "Question-Box Department" by the Ohio Gaslight Association, which was intended to increase the facilities hitherto existing for clearing up points with regard to which the members desired enlightenment. It was then stated that, for the 1903 meeting of the Association, a list of something like 600 questions was prepared under the new arrangement, and that of these 458 were answered. This was encouraging for a beginning; and when issuing the questions and answers in pamphlet form, the Editor of the new department (Mr. Henry L. Doherty) expressed the hope that the idea would be tried another year. This hope, we are pleased to see, is to be realized, for Mr. Doherty has recently sent out a further long list of questions, with a note requesting the receivers of copies to circulate them among all the officers and employees of the companies with which they are connected, as well as any others who can supply answers to the queries put. There is also a form for filling in by persons who agree to furnish replies to particular questions, and who are able to suggest the names of others from whom answers might be requested. A first edition of the list was sent out a fortnight earlier; and in the one last circulated (besides some additional questions being put) the queries already answered are indicated, so that those who are still desirous of assisting the Association may know to which points they can most usefully turn their attention.

Its Scope,

Indeed, there is not likely to be any difficulty in finding a suitable subject, unless it arises from the wide selection that is offered. The second list (which is before us) contains some 235 questions, the majority of which appear to have been still unanswered when the circular was issued, about the middle of last month. Of these, 109 refer to manufacture, 28 to distribution, 2 to office methods and accounting, 19 to appliances, 1 to new business matters, 1 to legal and financial matters, 24 to residuals, 11 to management, and 40 to miscellaneous matters. Thus every branch of the service is covered—and well covered, too. Doubtless, it is easier to ask questions than it is to answer them—at any rate, this was Mr. Doherty's experience on the last occasion, for he had to confess that, though the replies did not equal his expectations, the number of questions asked far exceeded his calculations. Still, it is not always a simple matter to hit upon points the elucidation of which is likely to be of general interest; and the Association are therefore to be congratulated upon the fact that so many subjects coming within this category have been tabulated. For instance, no one concerned with the welfare of the industry can be indifferent to the question: "What form of advertising has been found most productive for gas companies?" This, of course, is only one example. There are very many other matters of equally wide interest broached; but the question quoted is quite sufficient to show the usefulness of the scheme, not only to the members of the Association, but to gas men generally.

And the Need for Co-operation.

The Ohio Gaslight Association and the Editor of the Question-Box Department have, it must be admitted, set themselves a big task; but the results should amply justify the work, worry and expense involved. In his last report, Mr. Doherty acknowledged that it might not be possible within the limits of the membership of the Association to find the best solutions of the various problems set forth; but he thought the fact that, in the efforts made to solve them, some outside this limit would certainly be benefited, should be sufficient justification for looking beyond the ranks of membership for co-operation and assistance. In sending out his present list of questions, he again appeals for the help of everyone interested in the gas business to make the project a success. It seems impossible to doubt that this aid will be most willingly accorded—more especially having regard to the

statement that the plan has already received the hearty commendation of many gas men, a large number of whom are interested in, and anxious for, its continuation. As Mr. Doherty truly points out, the only persons who are not interested in some degree in the carrying on of the department are those who can answer all the questions given in the present list, and any others of value which may be asked in future lists. Anyone who is able to do this, he says, will receive no benefit from the question-box publication. But other people will, and therefore the fortunate possessors of the requisite knowledge to enable them to answer all the questions should be generous enough to contribute at least a portion of this information to those gas engineers and managers who are not so well equipped. Mr. Doherty and his Association deserve well of the industry for their efforts; and appreciation of what they are doing can best be shown by a cordial support of the Question-Box Department. The scheme appears to be in every respect an excellent move; and who knows but that some day we may see the same idea adopted in connection with our English Associations? At any rate, the matter should be worth serious consideration this side.

Competition and Protection in Gas Supply.

Many gas companies in this country are prone to complain, and in some measure not without reason, of the oppressive conditions which are imposed upon them as the price to be paid for the monopoly (or nowadays in some cases the partial monopoly) which they enjoy. Still they continue to thrive; the gravamen of their complaint being that without such inflictions as those which they find burdensome, they would be able to do even better for the communities they serve than at present. With this we can heartily sympathize, and that sympathy has taken the active form of doing as much as within us lay in the cause of relief. Yet when the position of protected gas supply, with all its attachment of onerous conditions, is compared with that in other countries—with the Continental concession system, and with the simple permissive system of democratic America, where those who are engaged in the private enterprise of supplying gas or electricity to a city or town never know what the morrow will bring forth in the way of competition—then those similarly engaged in this country have much to be thankful for. The point is brought home by a very striking illustration that Mr. John West has put in the form of a communicated article in this week's issue. After reading it one cannot help feeling more strongly than ever that there is great moral goodness in the legislative regulations under which such services as gas are carried on in this country, and which operate to the advantage of both suppliers and supplied. The surprise is that America and other countries have not before this taken a leaf out of our book in this respect. The system which prevails in America (which is so go-ahead in many other matters) in regard to gas supply produces—Massachusetts perhaps alone excepted—a disastrous state of things, through the instability created, the consequent destruction of the confidence of the investor, and the high price consumers are called upon to pay for gas.

Cleveland the Example.

Cleveland is the scene of the story referred to in the preceding paragraph which Mr. West has to tell. The Gas Company supplying that city is presided over by Mr. M. S. Greenough, who is well known by many gas engineers in this country. Less than two years ago, under his capable direction, the Company were in the midst of great prosperity—supplying 18-candle gas at the low price for America of 75 cents. New business under such conditions was coming in fast; and the necessity of extending the works plant was under serious consideration. To-day, within (say) eighteen months, a great change has come over this fair scene. The city has been attacked by the Standard Oil Trust, who, in the meanwhile, have brought to it natural gas from a distance of 208 miles, and have already laid over that distance and in the streets some 300 miles of mains. Cleveland being situated such a length from the natural gas-fields, the Gas Company were seemingly quite secure from any such competition; but, as seen, they did not take advantage of the supposed security. However, a matter of a few hundred miles turns out to be a small thing with such predatory trusts as the one which has entered Cleveland, whose policy appears to be to wean the consumers from the old Company by the supply of the natural gas at a low rate, and, when ultimately they have succeeded (this, we take it, is what they are aiming at in Cleveland) in undermining, by competition, the strength of the existing concern, to buy it over at practically their own price. The strongest concern, of course, wins in the end. The Gas Company are already feeling the competition very acutely. The increase in consumption has been stopped, a less quantity of gas is now being supplied than formerly, the shares have been depreciated in value, and where the waste of capital and destruction of business is going to end, no one can yet predict. What of the consumers? Someone will have to pay for all this expenditure of capital and for the effects of the competition; and who but they? If the Standard Oil Trust should eventually (if this is one of their objects) succeed in getting under their control the whole of the gas supply of the city, the consumers will in all probability find that their latter state is far worse than the comfortable one in which they were participating with the Gas Company less than two years ago.

The Lessons, and a Qualification.

We will not traverse the whole story told by Mr. West. As is his wont, he relates it plainly, and draws from it the lessons that it teaches. Chief among these are the advantages of British gas legislative enactments as compared with the instability of the conditions under which gas companies pursue their business in America. We agree with him in what he says in this regard; but, even so, there is a point at which the truth of it stops short. Gas enterprise in this country is completely protected for general lighting and for the domestic uses of cooking and heating, and it is fully so protected in the greater part of the country where manufactories are non-existent or are few and far between. But when we turn to the great northern districts where industrial establishments are plentiful, it must be admitted that times have partially changed. In recent sessions of Parliament, sanction has been accorded to large power-gas companies to compete in the supply of gas for industrial purposes. But that competition is also regulated; and it is being kept within certain limits. It can affect but little the bounds within which the present gas supply holds sway; but it does this—it opens to competition one of the most promising fields that the existing gas suppliers in industrial districts had for future enterprise. That is all; but it is quite sufficient to show that the protection which the gas suppliers of this country enjoy has been encroached upon, and with the sanction of Parliament. Furthermore, competition in electrical supply is going on to-day in the City of London; and the Post Office has for the past few years been competing with the National Telephone Company—all under parliamentary authority and regulation. Nevertheless, we have the knowledge that Parliament will never allow the repetition of such competition as Mr. West described as having existed in the old days. The state of things that that competition then gave rise to, town communities would not brook now. Under statutory protection and control, too, the existing gas supply of this country has built for itself a sure foundation, which is daily becoming stronger and stronger, to the benefit of all. We live, therefore, in the happy knowledge that nothing is ever likely to occur in this country such as the Cleveland Gas Company are suffering from to-day. We can sympathize with them; but all the sympathy in the world will not avail them. Their present position, however, is a hard reward for their past enlightened conduct of the supply of gas in the city; and we heartily hope they have reached the worst stage that they will experience in the competition. But it is feared they have not. The quicker the gas supply of America is brought under a different order of things, the better will it be, alike for suppliers and consumers. Who with pecuniary interest in the Cleveland Gas Company will deny this to-day?

A Municipal Newspaper's Strange Deduction.

In drawing from a number of ascertained facts an inference for which one may be held responsible on its promulgation, it is essential that it should be drawn with deliberation, and not hastily. We accuse the "Councillor and Guardian"—a municipal organ—of having been guilty of the latter fault. In a leading article on the Gas Undertakings Returns, our contemporary says: "For a given amount of gas made and consumed,

the ratio of local authorities' customers to companies' is three to two. To put it another way, the municipal bodies are properly discharging their duties in popularizing the supply and drawing their returns from as wide an area as possible." This means, if anything, that the municipalities are doing these things in a better manner than the gas companies. The statement of the indiscreet "Councillor and Guardian" is not going to incite us to say anything to the discredit of municipal gas undertakings; but we should not like this little piece of dogmatism on the part of that paper to be accepted by town councillors as an established fact without pointing out a few figures which put another complexion on the matter. Now, the returns show that, in number, the companies' and local authorities' gas undertakings have since 1882 increased about *pari passu;* and it is also common knowledge that, for the most part, if not entirely, the increase in the municipal undertakings has come about by the transfer of prosperous gas companies' undertakings, while the increase in the companies' undertakings is represented by those small non-statutory concerns that have obtained parliamentary authorization and, perhaps in a few instances, by the inception of new undertakings in undeveloped districts. Taking this into consideration, it shows the enterprise of the gas companies to find that in the aggregate, since 1883, their mileage of distributing-mains has been extended by 5598, which comes within 400 miles of the extensions made by the local authorities in, generally speaking, more influential districts. But remembering what has been said about the character of the additions to the companies' undertakings, and the proud boast of the "Councillor" as to what the municipal bodies are doing in popularizing the supply, is it not rather a remarkable thing to find that since 1882 the companies have added 1,142,978 consumers to their number, as compared with 1,053,776 consumers in the case of the local authorities? There appears to be something wrong with the deduction of our contemporary.

A Few More Tough Facts.

It seems hardly necessary to carry the matter further; but, while upon the subject, a few additional figures may show our obtuse contemporary why we cannot quite see eye to eye with them. The companies are shown to possess collectively 2,197,987 consumers, and 17,512 miles of mains; the local authorities, 1,970,738 consumers, and 11,632 miles of mains. A couple of little division sums make it clear that the companies have 126 consumers per mile of main, as against 169 in the case of the authorities, which is just what one would expect when it is considered that so large a number of the companies are in undeveloped country districts. Notwithstanding this advantage in the number of consumers per mile of main, it is found by dividing the total consumption of gas by the miles of mains that the consumption per mile in the case of the companies is 5,251,040 cubic feet, as against 4,795,101 cubic feet in the case of the local authorities; in other words, with 43 less consumers, and (let us not forget) half-a-dozen less public lamps, per mile of main, the companies have a higher consumption than the authorities to the extent of 455,939 cubic feet per mile of main. One more set of figures. Dividing the total consumption of gas by the number of consumers (neglecting consideration of public lamps), the companies show an average of 41,836 cubic feet per consumer, as against the local authorities' 28,302 cubic feet! We are not going to deny that the responsible officials of municipal gas undertakings are doing the best they are able in popularizing the gas supply; but the quoted remark of the "Councillor and Guardian" is quite incomprehensible, in view of the companies' superior position in consumption per mile of main and consumer, notwithstanding their disadvantage, taken over the whole, in regard to developed area.

WATER AFFAIRS.

Progress of the Metropolitan Water Arbitration.

THE inquiry into the claim of the Lambeth Water Company, commenced on the 18th ult., was brought to a close on Monday last week; but the Arbitrators will not make their award until after Sir John Wolfe-Barry has inspected the works. While at West Molesey, he will take the opportunity, in compliance with a special request, of looking over those of the Southwark and Vauxhall Company, whose case was next taken, and engaged the attention of the Court all the week. The amounts put in at first were £4,935,520, assuming that there was to be no deduction for payments into the sinking fund, and £4,693,117 supposing it should be decided on the appeal that such payments ought to be deducted. As in the case of the East London Company, no offer was made for the undertaking by the Water Board. The principal item of the claim was a sum of £3,802,674, the Company's net income multiplied, as with the other Companies, by 36·36; while the value of surplus lands was put at £400,707, and of surplus works and plant at £397,716. The Arbitrators, however, found it would not be convenient to deal with the claim on the basis proposed, as they thought they should inquire into prospective as well as past profits; and valuation upon these lines ought to be followed. An amended claim was accordingly submitted which amounted to £5,364,437 after deducting the sinking fund payments, or £5,513,946 with these excluded. The inquiry proceeded on these alternative sums. The Company's Accountant (Mr. Arthur Newton) explained the way in which the totals had been arrived at, and said the claim now put in was based on the assumption that the Company would raise their present dividend of 7½ per cent. to their maximum of 10 per cent. up to 1908, as well as pay large sums in respect of back dividends. As the number of supplies and the water-rental had shown a steady increase during the past ten years, he thought the Company were justified in claiming 12 or 13 per cent. in the future.

The ground of attack, as gathered from the cross-examination of the witnesses, was very much the same as in the Lambeth case. Mr. Newton had to confess that in 1897 the Company were obliged to go to Parliament for temporary powers to enable them to furnish the necessary quantity of water in their district, and that the provisions of the Act then obtained were extended in the following year on the express condition that the value of the undertaking should not be enhanced thereby. On making this admission, Mr. Fletcher Moulton suggested whether the witness was really serious in putting before the Arbitrators a proposition that an undertaking in the condition he had described ought to be valued on a 10 or a 12 per cent. basis. Mr. Newton frankly acknowledged that he was; and he justified his attitude by pointing out that the circumstances of the Company had entirely changed. He explained that the expenditure in the past ten years must not be taken as a criterion of what would be incurred in the future, seeing that the closing of the Battersea works—an object which for a long time the Company had kept steadily in view—would effect a saving of £15,105 a year, and provision had been made for future capital requirements.

The Company's Chief Engineer (Mr. James W. Restler, M.Inst.C.E.) agreed with Mr. Newton on this point, and spoke generally as to the adequacy of the works, which he said had been kept in thorough order out of revenue. Testimony was borne to their excellent condition by Mr. James Mansergh, who spoke highly of the Company's pumping machinery, which he characterized as the best he had seen in London water-works. Mr. Charles Hawksley was equally eulogistic; and his remarks were supported by other engineers. Professor Hull was called to speak as to the yield of the Company's wells; and then it only remained to show that the quality of the water the Company supply is good. This was done with the valuable aid of Sir William Crookes and Professor Dewar, who brought before the Arbitrators the striking fact that, as the result of more than 40,000 bacteriological examinations of water, they had never found a pathogenic organism in it. They admitted having met with the redoubtable *B. coli communis;* but it appears that bacteriologists do not regard this creature as being so formidable as they at one time thought. Sir William Crookes said he did not attach any importance to its presence in water, except in very large numbers. But so far as crude Thames water was concerned, it had decidedly improved. On the whole, therefore, the Company seem to have presented a good case to the Arbitrators. At its close on Saturday, Mr. Moulton opened that of the Board; and we shall see this week what they have to say in answer to it.

Property of the gross value of £100,798, including personalty of the net value of £91,955, has been left by Sir Frederick Bramwell, whose death was recorded in the "JOURNAL" for the 8th of December.

THE GAS AND WATER STOCK MARKET.

(For Stock and Share List, see p. 294.)

ALTHOUGH the chances of peace being maintained in the Far East became more and more attenuated day by day during the past week, yet the position of things on the Stock Exchange was not half so bad as might have been expected. Prices fell, of course; and though rallying a little now and then, they closed generally low. But speculation has lately been within such moderate bounds as to obviate the risk of difficulties on a big scale. Consequently, the fortnightly settlement was a light job, and gave rise to no entanglements. The extreme abundance in the Money Market had a lubricating effect. Discount rates were very easy, and a reduction in the Bank rate might have been possible but for war alarms. Business in the Gas Market opened with a flourish, and bade fair to be brisk; but it quieted down soon afterwards, and jogged along easily till the end of the week. The general tendency was good and steady; and what few changes in quotation were effected were in the upward direction. The first of the accounts for the second half of 1903—those of the Gaslight and Coke Company—were issued last week, and showed that, despite a small shrinkage in the sale of gas, cheaper coal and good receipts for residual products have largely benefited the Company. The ordinary stock was considerably dealt in last week at very steady figures—never ranging more than a fraction above or below 90, and the closing mark being 90¼. The secured issues were rather quiet and steady. Very little was done in South Metropolitan; only two or three parcels changing hands at middle figures. The aggregate of business in Commercials was just about the same; but the 3½ per cent. was put up a point. In the Suburban and Provincial group, there was some renewal of activity. Alliance new improved; and it almost looked as if one or two other issues might have been advanced, though they were not. Business in the Continental Companies was slack. Imperial was weaker; but the quotation held good. European, on the other hand, was strong, and the part-paid shares moved up on *ex div.* changes. There was nothing to note in the remoter undertakings. Business in the Water Companies was moderate; but the tendency was good, and one or two issues achieved further advance. Southwark was specially in demand at higher figures; and Chelsea (both ordinary and preference) advanced. A recovery in New River debenture stock was noteworthy.

The daily operations were: Gas opened active on Monday, with many dealings in Gaslight ordinary; but quotations did not move. Tuesday was quiet and unchanged. In Water, Southwark and Chelsea rose 5 each; and both Chelsea preferences 2. Wednesday was rather brisker, and prices were good. Commercial 3½ per cent. gained 1, and Alliance new ½. Subsequently Gas was quiet and unchanged. But in Water, Southwark "D" improved 5, and New River debenture 2 on Thursday. Southwark ordinary rose 5 on Friday, and again 5 on Saturday.

ELECTRIC LIGHTING MEMORANDA.

Charges for Electricity — Load-Factor Fallacies — Disappointing Results of the Business—The Hopkinson Principle—The Isle of Wight Nuisance Case.

IT is worthy of remark, that wherever engineers in charge of central electricity supply stations congregate, they are all for discussing methods of charging for supplies to different consumers, and for various applications. The discussion is always continued afterwards in the technical journals, and some time usually passes before the echoes of any paper on the subject finally die away. It has been so in the case of Mr. Crapper's paper read at Leeds, which we dealt with some weeks ago. One reason for this persistence of controversy on electrical charges is the recognition of the fact that the trade does not flourish as it ought to do, on theoretical grounds. Disappointment is felt, and no longer concealed, at the hopeless state of the "load-factors" of all purely lighting stations. The prophets of the downfall of gas, and the proclaimers of the superior advantages of electricity as "the light of the poor," have given it up. The strain of so much make-believe has been too much for them; and it is at last conceded that the superior efficiency of gas for lighting, heating, and supplying distributed motive power, is answerable for the backwardness of central station business. Every palliative so far tried has failed. Dust-burning, as a means of reducing the cost of steam power, has found its level. Electricians, like other people in trade, have learnt that volume of business is far and away more important to the making of profits than working economies. Nor is there any comfort to be derived from the taking-on of a tramway power business. This may swamp the lighting figures; but it cannot improve them.

Hence the reason for the solicitude of station managers to improve their original and still most profitable trade—that is the supply of light to private consumers. What is it they have to complain of? Is it the ordinarily poor "load-factor?" It is nearly time they realized the truth about this bugbear of theirs. We do not know to whom the electric lighting industry owes this conception of the load-factor; but it is not clear whether his name and achievement ought to be held in honour or in contumely. For if he succeeded in giving a name to the trouble of the trade, he no less presented his fellows with a catch-word which has not invariably served them well. When the average central station manager, confronted with the truth that he is not making both ends meet, has muttered this "word of fear," he is apt to think he has said something unanswerable. This excuse, explanation, apology, or whatever it is, has been greatly overdone. Besides, in nine cases out of ten it is a misapplied term. Electricians blame the load-factor of their stations, when the cause of trouble is failure of demand—a very different thing. A low load-factor, as the "Electrical Times" correctly points out in criticizing Mr. Crapper, has nothing to do with the competition of gas or other rival of electric lighting. It is really due to the sun, and, we may add, to the early-closing movement. Arithmetically speaking, it is determined by the number of hours of darkness during which artificial light is required. If the people living in any particular latitude could be persuaded to burn away daylight, or work or sit up late into the night, the load-factor of the electric lighting station would doubtless improve; but it is difficult to see what other good would follow. The artificiality of the condition shows how idle it is to look for its fulfilment.

It is not the load-factor, or not this only, which prevents the majority of electric lighting undertakings from paying. It is want of sufficient custom within the original limits of supply—not cured, but rather made worse by reckless extensions of distributing plant in search of distant customers. How many of the administrators of a public electric lighting undertaking have had the moral courage, as well as the commercial aptitude, to resolutely close the capital account until the first scheme has been found to pay? This lack of custom has no more to do with a load-factor than with the man in the moon. We await convincing proof that it is amenable to "maximum demand," or any other dodge intended to induce people to use the light otherwise, or at any other time, than they want it. What these fancy systems do is to fasten an artificial—that is to say, a suppliers' classification of desirableness—upon the possible consumers, which, though it is reputed to help some, really acts by discouraging others. Discouragement of the "undesirable" customer is also the principle at the bottom of the plan of charging 1d. per unit for electrical power so long as it is not taken during lighting hours. It is open for anyone to argue that this is a useful expedient for the supplier; but we do not believe the public appreciate it. Trade depending on discouraging patrons has not much to boast of.

This public classification of some revenue as desirable and of other income as undesirable, is peculiar to the electric lighting industry; and it is likely so to remain. One wonders what would be thought of a railway company who should attempt anything like it. Why should not some London and Suburban line, for instance, charge season-ticket holders more than the general public, on account of the habit of the former in making a "peak load" on the system twice a day? The weakness of the electricians in this regard is probably attributable to the circumstance of their order of mind being more scientific than commercial. They were, consequently, far more impressed by Dr. Hopkinson's analysis of the sources of expense in the running of a central electric lighting station than, it is safe to say, an ordinary retail trader would be even now. The Hopkinson analysis was quite correct. Station charges can be distinguished under two heads—the standing and the varying expenses; but it by no means follows that the customer should be charged accordingly. We fancy the great Whiteley and his like would laugh such a proposition to scorn, if it was suggested to themselves. Is the habitual time-wasting "shopper" to pay more for the trifles she buys after all, than the "buyer" who knows exactly what he wants, and gives his orders in a breath? Perish the thought! Cheap retailing is not managed in that way. From all this, and much more that could be preached on the same text, it is to be concluded that gas lighting, heating, and motive power do not beat electricity supply through the "load-factor," but on the consumers' bills. Dodge the price of the unit as they will, at the end of the quarter the shopkeeper or the private resident who has indulged his fancy for electric lighting discovers that his light has cost him more than gas. The sole exception is the large user who has produced his own electric light by the aid of a gas-engine, which can be done usually at a cost of about 2d. per unit.

While on the subject of gas-engines for electricity generation, it may be mentioned that the common law of nuisance has descended heavily on the Isle of Wight Electric Light and Power Company, who undertook to carry out a Provisional Order of the Corporation of Ryde by means of a producer-gas plant. It does not appear that the choice of this kind of motive power was inspired by any preference for it, but was due to the circumstance that the erection of a tall chimney-shaft was forbidden on their site. Unfortunately for the Corporation and their lessees, Ryde is not a manufacturing town, and the establishment of "works" within its borders is not regarded with favour by the residents, who are charged handsomely for the privilege of living in so pleasant a locality. It has always been a foible of electricians to see nothing objectionable in the steam factories required for generating electricity for local consumption; and therefore it would not occur to them that any intruder of the kind could offend in Ryde. Being forbidden a tall chimney, which would have advertised a "works" unmistakably, they imagined they might with impunity fall back upon gas-producers. It is not for us to disparage these

appliances as sources of motive power; but we cannot affect any surprise that a leaseholder at a rent of £250 a year of a house, gardens, and grounds in the borough of Ryde, revolted against the idea of having such plant installed next door. The Corporation, at any rate, might have been expected to know better than to countenance such an encroachment upon the amenities of the locality. No sooner did the aggrieved resident perceive what had been prepared in the next piece of ground to her garden, and have a first taste of the noises, vibration, smells, and dirt resulting from the operation of the plant, than she commenced an action for an injunction and damages. This action was tried before Mr. Justice Joyce during several days of last Michaelmas sittings; and it completely succeeded. The defendants pleaded their statutory right to carry on their undertaking, provided they used all reasonable skill and care to avoid annoying their neighbours. The defence failed—the Judge holding first that "the acts complained of had from time to time, and frequently up to the trial, materially interfered with the ordinary and comfortable existence of the plaintiff in her house; and, secondly, that these acts were such as, having regard to the circumstances and surroundings of the defendants' property, were in excess of the natural and ordinary use and enjoyment of the property." The consequence was the issue of an injunction restraining the defendants from "using or working, or causing or permitting to be used or worked, in or upon their generating station and other works adjacent to the plaintiff's gardens, any engines, dynamos, or other machinery, and from carrying on the manufacture of gas or any other process in such a manner as, by the production of noise, noxious or offensive smells, vibration, or otherwise, to be or occasion nuisance, or annoyance to the plaintiff." The importance of this judgment does not require emphasizing. It will be fraught with serious consequences to the defendant Company, though it may be possible for them to avoid sudden disaster by taking a supply of gas from the Ryde Company. This might get rid of the local difficulty; but the use of gas-producers in towns not given over to manufactures will obviously be discouraged by the judgment.

MUNICIPAL TRADING IN ONTARIO.

THE subject of the municipal ownership and control of public utilities is one which, as readers of the "JOURNAL" do not require to be reminded, has been much discussed on both sides of the Atlantic during the past few years. In this country, it has of late given place to the larger question of fiscal reform, and consequently is for a time in abeyance; but in the United States it is still occupying attention, as testified by Mr. Doherty's paper at the meeting of the American Gaslight Association. Farther north, in Canada, people are manifesting a desire to know whether municipal ownership is or is not good for a community; and this desire found expression, in the spring of last year, in a motion by Mr. J. M. Gibson, in the Legislative Assembly of the Province of Ontario, for the appointment of a Committee for the purpose of selecting reports of Commissions or other authorities on the subject, and printing and distributing them to the members of the House. The motion was carried, and the Committee was appointed a few days later, with power to engage the services of a Secretary, and incur such expenditure as might be necessary in procuring suitable material for publication. Mr. Gibson was chosen to preside over the deliberations of the Committee; and the important secretarial work to was entrusted Mr. Avern Pardoe. In order to assist the Committee in their investigation, the Legislative Assembly, on the 12th of June, ordered a return of the reproductive undertakings operated by Municipalities in the Province, on the lines of the one ordered by our own House of Commons in 1902; and Mr. Pardoe proceeded to collect other material of a much more argumentative and less purely statistical character bearing upon the subject. In September he was in a position to report to the Committee the results of his labours, the extent of which is amply shown by a pamphlet in which they are embodied, a copy of which has been forwarded to us.

A striking example of Mr. Pardoe's industry is given at the very outset in his bibliography of the subject engaging the attention of the Committee. We do not seem to have been talking about it for many years, and yet the list of books, pamphlets, and articles published thereon occupies nine large pages. The "JOURNAL" and our American contemporary are acknowledged for the share they have taken in throwing light upon this important question. As Mr. Pardoe truly says, there is no lack of material; on the contrary, there is so much of it that he has found it difficult to give, within reasonable limits, a fair representation of all the views held. In fact, it was only by religiously excluding such questions as did not possess really practical interest that his abstract of the discussion was reduced to the dimensions it has taken. What Mr. Pardoe has done has been to collect a number of extracts relating principally to the municipal or other ownership of gas, electric light and power, and water plants, as well as street railways; and he has with great fairness endeavoured to give as nearly as possible an equal quantity of argument on every side. He very judiciously declines to appraise the value of the material he has presented, or say whether it is preponderatingly for or against the principle of municipal ownership. This will doubtless be done by the Committee in their report. They will certainly not have cause to complain of a paucity of matter on which to base their conclusions, for it occupies 224 pages. Mr. Pardoe begins with the genesis of the movement against municipalities, who were roundly charged with being tainted with corruption, with carrying on trading concerns at a loss with other people's money, with causing increased municipal debt and greater local taxation, and with truckling to the labour interests and promoting Socialism; and he quotes or summarizes all the important expressions of opinion in support or in refutation of this charge, down to Major Darwin's book published last October. With the exception of this, most of the arguments adduced have already been dealt with in our columns, and therefore need not be further noticed.

Following Mr. Pardoe's extracts are the statistics furnished in compliance with the Order of the Legislative Assembly previously mentioned. Forms were sent to 254 Municipalities, including 14 cities, 106 towns, and 134 villages. On the 18th of November last, 12 cities had made returns, and all but one (Stratford) had been carrying on reproductive undertakings prior to December, 1903. Of the towns, returns had been made by 90, and 57 of them had been carrying on public utilities, while 33 had not. With regard to the villages, of the 118 which had sent in returns, 21 had been carrying on reproductive undertakings and 97 had not. Two cities, 16 towns, and a like number of villages, failed to comply with the Order. A number of the Municipalities communicated with reported that they were either constructing or purchasing water-works or electric lighting plants. The municipal control of gas undertakings does not seem to be greatly favoured in Ontario, as only two cases—at Brockville and Kingsville—are given in the returns. At St. Catharines, the Municipality return "Gas Company's stock, $26,000." It produced in the year ending Dec. 31, 1902, an income of $2189, which went into the general fund. Brockville has borrowed $85,000 for purposes of gas supply, and there is an outstanding balance of $78,108. The profit of $4000 is placed to the capital account, and is used for repairs. At Kingsville, the Municipality supply natural gas, and they have borrowed for the purpose $27,000, of which $13,787 was outstanding at the date of the return. There was a small loss on the undertaking; and it was made good out of the general fund. Powers to supply electricity are held by about 40 Municipalities; but they do not appear to be exercised by some of them. In several cases, losses were incurred, which had to be made up out of the general fund; but at Dundalk the fund was augmented to the extent of $7·10 through the electric light business!

There is a pretty general opinion in Ontario that the supply of water should be in the hands of the municipal authorities, for out of the 126 who make returns, only 15 do not control this service. The most important undertaking is, of course, that of the Municipality of Toronto, who took it over in 1878 from the Commissioners in whose hands it had been since 1871. The total amount of capital (inclusive of borrowed money) provided by the Corporation is $4,171,151; and the outstanding debt when the return was made up was $3,895,094. The average annual income is given as $325,284; and though this is $197,742 more than the average expenses, the sinking fund and interest payments produced a deficit of $24,127, made up out of the general fund. The Municipality charge a minimum rate of $1·50 per house. Outside the city, 25c. per 1000 gallons is the rate charged, with meter-rents varying with size. Hamilton began to manage its water supply in 1861, and has put $2,006,849 into its water-works. The average annual profit realized is given as $70,970; and it goes into the general fund. Ottawa, on the other hand, employs its profit of $15,015 in extending the works. London, with its $898,135 of capital, realizes an annual net profit of $26,519, of which about $7000 is expended in improving the works. At Windsor, the profit of $1116 is carried forward in the form of an asset. Deficits are recorded in several of the smaller places. For example, Galt, which has controlled its water-works since 1892, returns one of $5214; while Goderich, which has been in the business since 1887, cannot make ends meet by $3059.

Owing to the failure of a few municipal officers to comply with the Order of the House, the returns are not quite complete; but it is expected that all the imperfections will have been remedied before the Legislature again meets. In their present condition, however, they furnish some interesting particulars, the value of which is considerably enhanced by the notes by which they are, in almost every instance, accompanied.

Reports of Gas Associations, 1903.—It will be seen, by an announcement which appears elsewhere, that this volume is now ready. It contains the reports of the proceedings at the meetings of the various District Associations of Gas Managers last year; the papers read being illustrated by eight plates and 39 diagrams, &c. These are preceded by an index, and followed by lists of the office-bearers and members of the Associations. This is the twenty-first year of publication of the book, which presents a large quantity of valuable technical matter in a shape which allows of easy reference being made to it. It therefore forms a suitable companion to the "Transactions of the Institution of Gas Engineers."

WATER BILLS FOR 1904.

(*Concluded from p.* 205.)

THE Barrow-in-Furness Corporation Bill is to empower the Corporation (among other things) to take 2 million gallons of water per day from the River Duddon before the completion of Seathwaite Tarn reservoir authorized by the Act of 1901, when the flow of the river is more than 10 million gallons per day. A tramroad is to be constructed for water-works purposes, between Dunnerdale Fell and a point near Foxfield Station on the Coniston branch of the Furness Railway. The tramroad is to be worked as a light railway, unfenced, and operated by any power other than electricity. A new road is also to be made, as part of the water undertaking. The sum of £7000 is required for water-works purposes, repayable in sixty years.

The Chesterfield Gas and Water Board Bill partly relates to water. The preamble states that the Club Mill reservoir authorized by the old Company's Act of 1855, has become defective, and is not now available for its purpose. It is proposed to raise an additional capital sum of £42,000 for water-works purposes, including the construction of a new storage reservoir upon the Linacre Brook, to be completed within seven years.

The Derwent Valley Water Board Bill is to confer further powers on the Board. It is proposed to abandon the construction of certain works authorized by the Act of 1899, partly by the Board and partly by the Leicester Corporation, subject to the payment of compensation for damage done. Other works are to be substituted for those abandoned, chiefly aqueducts. The compulsory purchase of the necessary lands is to completed within five years. All lands so acquired by the Board or the Leicester Corporation are to be exempt from the Mineral Courts Acts. Provision is to be made for the severance of lands. The financial arrangements of the Board and the constituent authorities are to be revised. The time limited by the Act of 1899 for the purchase of lands in certain parishes in Derbyshire is to be extended for three years from Aug. 9, 1906.

The Doncaster Corporation Bill contains a part relating to water supply. The additional sum of £45,000 is required for water-works purposes. The limits of supply by the Corporation are to be extended to include the parishes of Armthorpe, Sprotborough, Cantley, and Kirksandall. New works are to be constructed, comprising two pipe-lines and a service reservoir at Warmsworth, to be completed within seven years.

The Ebbw Vale Water Bill is to authorize the construction of additional works by the District Council, at an estimated cost of £75,000. The additional sum of £40,000 is required for other water-works purposes. The new works are to comprise a reservoir for impounding the waters of the Ebbw River in the valley known as Cwm Carno. Compensation water is to be discharged from this reservoir at the rate of 275,000 gallons per day in a continuous flow. The works are to be completed within seven years. Rates for domestic supplies are to be 7½ per cent. for houses of from £10 to £30 rental, and £5 for all above. Supplies for trade purposes by meter are to be charged at the maximum price of 1s. per 1000 gallons.

The Filey Improvement Bill partly relates to water. Sanction is sought for the provision and supply of public drinking fountains; for the inspection and cleansing of cisterns; and for allowing discounts not exceeding 15 per cent. for prompt payment of water-rates or large metered consumption. Additional sums for the water undertaking are to be borrowed under sanction of the Local Government Board.

The Harrogate Water-Works Tramroad Bill is to empower the Corporation of Harrogate to make a temporary tramroad to facilitate the construction of the reservoir and other works authorized by their Water Act of 1901, and also to provide telephonic communication between the municipal offices and the water-works. The tramway is estimated to cost £10,599. The proposed road would be 4½ miles long, and commence at a junction with the Masham branch of the North-Eastern Railway. The gauge proposed is 2 feet; and the line may be worked by any kind of power. The necessary land is to be acquired within two years, and the line completed within three years.

The Huddersfield Corporation Act, 1902 (Amendment), Bill is to correct certain provisions as to compensation water of the Corporation Water Act, 1869. These provisions and the conditions under which they were to be carried into effect are rehearsed in the preamble, which further admits that alterations were made by the Acts of 1890 and 1902 in regard to the filling and testing of the Butterley reservoir, the construction of which had given trouble. No notice of these contemplated alterations was given to the interested parties; and the present measure is intended to remove all doubts as to the effect of the enactments in question. It is therefore proposed that nothing contained in section 57 of the 1902 Act shall affect the rights of occupiers of mills and works or of the Corporation under any of their earlier Acts or Orders.

The Leeds Corporation (Water-Works) Railway Bill is for empowering the Corporation to make temporary railways and works to facilitate the construction of their authorized water-works in the valley of the Burn. One railway, of the standard gauge, is to begin with a junction with the existing sidings at the Masham Station, and to have a length of 5¾ miles; and two other short lines are to proceed from junctions with it. These lines are to be worked as light railways, and need not be fenced. They may be operated by any known motive power, including electricity. Permission is sought for the use of the railways by the Harrogate Corporation for the purposes of their water undertaking. It is also desired to provide telephonic communication. Money spent on these purposes is to be paid off in five years from the date of borrowing.

The Manchester Corporation (General Powers) Bill contains a part relating to water supply. It is proposed to purchase lands and construct a service reservoir at Heaton Park. A tramroad is projected, to connect the reservoir works with the Prestwich branch of the Lancashire and Yorkshire Railway. A clause is inserted to enable the Corporation to acquire, by compulsion or agreement, any mines or minerals under the site of the reservoir, notwithstanding the provisions in this regard of the Water-Works Clauses Act, 1847. The sum of £1,075,000 is required for the construction of the proposed water-works; and £225,000 for further expenditure on water-works purposes.

The Minehead Urban District Council Bill is to provide for the transfer of the undertaking of the Minehead Water-Works Company, Limited, to the Council, in consideration of the payment of a sum of £11,600, with certain further sums expended on capital account from the date of the agreement to that of the transfer. The Company's officers are to be compensated. The area of supply is defined. The rate for domestic supplies is put at 10 per cent. Domestic supplies are not to include stables. The water loan is to be repayable in sixty years. Demands under £100 are to be recoverable in the County Court.

The Oakengates, Dawley, and District Joint Water Board Bill is to constitute and incorporate a Joint Water Board composed of representatives of Urban and Rural District Councils in Shropshire. The constituent authorities are the Councils of Oakengates, Dawley, Wellington, and Newport. Members of the Board are not to be interested, either in their own name or the name of any other person, in any contract entered into or work done for the Board; nor are they to derive any profit or emolument from the funds of the Board, except as a shareholder of a company. One month after the date at which the Board are in a position to supply water from the works authorized by the Act, the part of the Wellington undertaking authorized in 1860 within the limits is to be transferred to the Board, on terms. Two new wells and pumping-stations are to be constructed at Newport and Oakengates respectively, with other works at Wellington and Wenlock, to be completed within five years. Clauses are inserted for the protection of the Duke of Sutherland. Rates for domestic supplies are to range from 7 to 5 per cent. Farm premises are to be supplied by meter at 1s. per 1000 gallons, with a minimum of 5s. per quarter. The Board desire to borrow £60,000 for sixty years. For the purpose of applications to Parliament, the Board are to be deemed to be a governing body.

The Preston Corporation Water Bill is intended to empower the Corporation to increase the capacity of their present water-works by the purchase of the Crawshaw reservoir and the water rights appertaining to it, from the Trustees of Stonyhurst College. The Spade Mill reservoir is also to be enlarged and deepened; and an additional service reservoir, to contain 4 million gallons, is to be constructed contiguously to the present Dilworth reservoir. The necessary lands are to be acquired compulsorily within three years, and the works completed within seven years. The rates for the domestic supply of water authorized by an Act of 1853 are to be altered, and made to range from 7½ to 5 per cent. The Corporation have been for many years supplying water without statutory privileges in the urban district of Longridge. This undertaking is now to be sanctioned, with the proviso that the supply to Longridge is to be given only from the Dean and Cowley Brooks and the Dilworth reservoir of the Corporation. The balance of unexercised borrowing powers of the Corporation is to be repealed, and instead the Corporation desire to raise the sum of £191,000 for water-works purposes. A sum of £95,500 was borrowed with the sanction of the Local Government Board, and made repayable in thirty years. It is now proposed to extend the period of repayment by twenty years; the other water-works loans being for fifty years.

The Rotherham Corporation Bill contains a small part relating to water supply; the main provisions relating to a desired alteration of older Acts of the Corporation, and of the Corporation of Sheffield, in regard to rating. It is also sought to make applicable for water purposes any capital powers not required for their original purpose.

The Selby Urban District Council Bill proposes to extend the limits of supply to include the parishes of Brayton Burn and Thorpe Willoughby. A new pumping-station is to be constructed at Brayton or Gateforth. The rates for domestic supplies are to be 8 per cent. on rateable property from £10 to £30 annual value, and 7 per cent. above. Metered supplies are to be chargeable at 1s. 6d. per 1000 gallons. It is to be made obligatory on owners of mine-shafts sunk within five miles of the pumping-station to line them water-tight down to impervious mineral strata, and to such a depth therein, not exceeding 750 feet, as shall prevent the draining of underground water from the well. The sum of £50,000 is required for water-works purposes.

The Shipley Urban District Council Bill contains clauses to sanction the laying of an additional main between the Graincliffe and Eldwick reservoirs of the Council, to be completed within five years, at a cost of £9000.

The Skipton Water and Improvement Bill contains provisions to sanction the construction of a new reservoir at Embsay-with-Eastby, to be formed by means of an embankment across the valley of the Embsay Beck. Until the completion of the reservoir, a daily flow of 250,000 gallons of water is to be discharged down the watercourse, and 196,000 gallons afterwards. The Embsay Water-Works Company, Limited, are to sell their undertaking to the Council. The sum of £69,000 is required for the new works; and £5000 for the general water-works purposes of the undertaking.

The Swindon Corporation Bill contains a part relating to water. It is proposed that water-rates and charges shall be made preferential payments under the Bankruptcy Act, 1888. The Corporation will seek to repeal section 41 of the Swindon Water Act, 1894, and make metered supplies for other than domestic purposes chargeable at the maximum price of 2s. 6d. per 1000 gallons, with a minimum charge of 10s. per half year. In all cases where the Corporation are actually supplying water by measure for domestic purposes by agreement, it is desired to determine any such agreement by giving six months' notice in writing, and thereafter the supply is to be continued and paid for on the rateable value of the premises. Power is sought for the establishment of a water reserve fund not exceeding £10,000. The sum of £10,000 is required for water-works purposes.

The Thurles Urban District Council Water Bill is to empower the District Council to make water-works for the supply of the district, by embanking the River Glashahulla. The maximum price of water supplied by meter is to be 1s. 6d. per 1000 gallons; and the rate for domestic supplies is to be 10 per cent. A loan of £9149 is required for the construction of the reservoir, and £1049 for mains and pipes, to be repaid within fifty years.

The Wallasey Tramways and Improvements Bill contains some water clauses. Metered supplies for other than domestic purposes are to be chargeable at the maximum price of 1s. 6d. per 1000 gallons, with a minimum charge equal to the amount of the leviable water-rate on the premises. Cisterns must be provided for supplies to boilers. Discounts of 10 per cent. may be allowed on water charges.

SETTLE-PADFIELD VERTICAL GAS-RETORTS COMPARED WITH HORIZONTALS.

Ground Space, Material, and Production.

THE letter from "Engineer" which appeared in our last issue called attention to an error which, the assurance can be given, quite inadvertently crept into the article on "The Coming of the Vertical Retort." The oversight occurred in connection with the calculation as to the cubic feet of brickwork that would be contained in 24 beds of six Settle-Padfield vertical retorts. These 24 beds would be set in two ranges in one house; and in making the working to ascertain the cubical measurement, the end walls of both benches were taken, but only the remaining brickwork of one bench. The mistake, of course, modifies to an extent a few of the succeeding figures in the article. In explaining the matter last week, it was promised that the corrections should appear in the present issue. It has been decided that the best form in which this can be done is to publish the calculations in full; and this will serve the double purpose of rectifying the few errors depending upon the original one, as well as of showing how the workings were made.

Horizontal Retort-House.

Retort-house 142 ft. 6 in. by 70 ft. = 9975 square feet.
Coal 96 tons in 24 hours.

$\frac{9975}{96}$ = 103 sup. feet per ton.

96 tons at 10,300 cubic feet per ton = 988,800 cubic feet.

$\frac{988,800}{9975}$ = 99 cubic feet of gas per square foot of floor area.

Vertical Retort-House.

Retort-house 142 ft. 6 in. by 60 ft. = 8550 sup. feet.
(24 settings of sixes = 144 retorts at 15 cwt. each = 12,800 cubic feet per ton = 1,382,400 cubic feet per 24 hours.)

$\frac{8550}{108 \text{ tons}}$ = 79 sup. feet of floor area per ton of coal carbonized

$\frac{1,382,400}{8550}$ = 161 cubic feet of gas produced per sup. foot of floor area.

	Horizontals.		Verticals.		
Sup. feet of floor area	9975	..	8550,	*less*	**1425**
,, per ton of coal	103	..	79,	*less*	**24**
Cubic feet of gas per sup. foot	99	..	161,	*more*	**62**

N.B.—56 feet is ample (55 ft. 4 in. will suffice) for width of retort-house with two ranges of verticals—viz.,

	Ft.	In.	
Benches will take	21	6	
Between benches	14	0	
Between benches and outside walls	20	6	(10 ft. 3 in. each)
	56	0	

Cubical Capacity of Horizontal Bench.

Ten beds of eights = 118 ft. 6 in.
118·5 × 20 × 11 = 26,070 cubic feet of brickwork.

$\frac{26,070}{96 \text{ tons}}$ = 271 cubic feet of brickwork per ton.

$\frac{988,800}{26,070}$ cub. ft. of gas = 37·8 cubic feet of gas produced per cubic foot of brickwork.

Cubical Capacity of Vertical Benches.

	Feet.
Twelve beds with 3 feet end walls	= 123
A second range of twelve beds in same house	= 123
	246

246 × 10·75 × 10·75 = 28,428 cubic feet of brickwork.

$\frac{28,428}{108 \text{ tons}}$ = 263 cubic feet per ton.

$\frac{1,382,400}{28,428}$ cub. ft. of gas = 48·6 cubic feet of gas produced per cubic foot of brickwork.

	Horizontals.		Verticals.		
Cubic feet of brickwork	26,070	..	28,428,	*more*	**2358**
,, ,, ,, per ton of coal	271	..	263,	*less*	**8**
,, ,, of gas per cubic foot of brickwork	37·8	..	48·6,	*more*	**10·8**

N.B.—Having two ranges of verticals, there are two extra end walls 3 feet wide, adding 6 ft. × 10·75 × 10·75 = 693 cubic feet of brickwork to verticals.

Length of Horizontal Retorts.

Horizontals = 1600 feet run = 16·6 feet run per ton of coal carbonized; 618 cubic feet of gas per foot run of retort.

Length of Vertical Retorts.

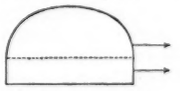
144 retorts 8 ft. 3 in. = 1188 feet run = 11 feet run per ton of coal carbonized; 1163 cubic feet of gas produced per foot run of retort.

	Horizontals.		Verticals.		
Feet run	1600	..	1188,	*less*	**412**
,, per ton of coal	16·6	..	11,	*less*	**5·6**
Cubic feet per foot run	618	..	1163,	*more*	**545**

Carbonizing Capacity of Horizontals.

22 in. by 16 in. by 20 ft. $\square = \frac{2·545 \times 10 \text{ ft.}}{2}$ = 12·72.

0·41 × 1·83 × 10 = 7·60.



Cub. Feet.
12·72
7·60
20·32

20·32 cubic feet for 10 feet length; 20 feet length = 40·64 cubic feet.

80 × 40·64 = 3251 total carbonizing capacity.

$\frac{3251}{96 \text{ tons}}$ = 33·8 cubic feet carbonizing capacity per ton.

$\frac{988,800 \text{ cubic feet of gas}}{3251}$ = 304 cubic feet of gas per cubic foot of carbonizing capacity of retort.

Carbonizing Capacity of Vertical Retorts.

Average diameter by measurement, 1 ft. 6 in. Retorts 8 ft. 3 in. long on centre line.
Area 1 ft. 6 in. = 1·767
1·767 × 8·25 = 14·57 cubical capacity of retort.
144 × 14·57 = 2098 total carbonizing capacity.

$\frac{2098}{108}$ = 19 cubic feet of carbonizing capacity per ton.

$\frac{1,382,400}{2098}$ = 658 cubic feet of gas produced per cubic foot of capacity of retort.

	Horizontals.		Verticals.		
Total cubic feet of carbonizing capacity	3251	..	2098,	*less*	**1153**
Cubic feet of carbonizing capacity per ton	33·8	..	19,	*less*	**14·8**
Cubic feet of gas per cubic foot of carbonizing capacity	304	..	658,	*more*	**354**

N.B.—Taking 15 cwt. of coal per retort per day = 420 lbs. per charge. The average weight of slack (thirteen classes) is 52 lbs. per cubic foot = $\frac{420}{52}$ = 8. It will be seen that there will be 62 cubic feet of retort still empty with this charge of 420 lbs.

Now it will be seen that, according to these workings (which for the horizontal and vertical retorts were made by independent engineers), and under the conditions specified in the opening calculations, the 24 beds of six Settle-Padfield retorts would require 1425 feet less superficial area than the 10 beds of eight 20 feet horizontal retorts, or 24 feet less per ton of coal carbonized, and would produce 62 cubic feet of gas more per superficial foot. In

the case of the vertical retorts, however, there would be 2358 cubic feet of brickwork more (which include 693 cubic feet for the two extra end walls). But compensation is found in the facts that the brickwork represents 8 cubic feet less per ton of coal carbonized, and the gas production works out to 10·8 cubic feet more per cubic foot of brickwork. Additional advantages shown by the figures are that the vertical retorts contain 412 feet run less than the horizontals, and 5·6 feet run less per ton of coal carbonized, while 545 cubic feet more gas are produced per foot run. The carbonizing capacity required in the verticals is shown to be less by 1163 cubic feet, or 14·8 cubic feet less per ton of coal; yet the yield of gas is 354 cubic feet more per cubic foot capacity. These figures are founded on the long experience with the vertical retort at Exeter.

THE WORK OF WATT AND MURDOCH.

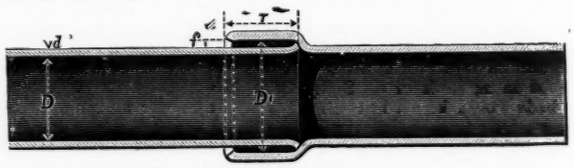
One of the most interesting speeches, so far as readers of the "Journal" are concerned, at the annual dinner of the Edinburgh Watt Club, which took place at the Imperial Hotel in that city on the evening of the 25th ult., was made by Mr. D. Macfie, who presided on the occasion, in proposing the toast of "The Memory of Watt." Mr. Macfie described Watt as a "pioneer inventor"—the steam-engine remaining, he said, practically what he left it; and referred to William Murdoch as his *fidus Achates* and most helpful of coadjutors. Murdoch became Boulton and Watt's right-hand man, and their "trusted co-worker and adviser" in all their mechanical undertakings. His fame rested on his being the inventor of lighting by coal gas. The first gas installation was completed in 1792, when Murdoch lit up his house and offices in Redruth, Cornwall, while superintendent of the firm's Cornish steam-engines. The value of this great invention—enough for the fame of any man—was hardly appreciated by Murdoch himself; and it seemed strange that Watt did not encourage him in his desire to patent the process. Modest as Watt himself, Murdoch let his opportunity pass; and his sole reward for his great invention was the Rumford Gold Medal of the Royal Society for a paper "On the Application of Coal Gas to Economical Purposes." Had he or the firm of Boulton and Watt taken out a patent for the process, the profits would no doubt have been enormous. Murdoch was described by James Naysmith, of steam-hammer fame, as "that incomparable mechanic." He was the inventor of the first model locomotive, completed in 1784; and while the idea, and probably the suggestion, came from Watt, the credit of the invention was now freely accorded to Murdoch. Watt dissuaded Murdoch from following up its first successful running out of doors, because of its interference with his regular duties. This, and Watt's rooted prejudice against steam road carriages, kept back the advent of the locomotive, as to which he said: "Let such as Symington and Sadler throw away their time and money in hunting shadows." This quotation might be taken as exhibiting Watt's extreme caution, and was in keeping with the attitude assumed by Boulton and Watt when strenuously opposing the use of high-pressure engines. On Murdoch being appointed Manager of Soho Works in 1810, he assigned to the firm his patent for the double "D" slide-valve, the rotary engine, and other inventions; and until 1830 he enjoyed a salary of £1000 a year. It was difficult to believe that he had not some title to greater consideration. Referring to the machine tools in use at the Soho Works, Mr. Naysmith said: "All these had William Murdoch's genius stamped upon them by reason of their common-sense arrangements, which showed that he was one of those original thinkers who had the courage to break away from the trammels of traditional methods, and take short cuts to accomplish his objects by direct and simple means." M. Charles Dupin, who attended the meeting called to vote a monument to Watt in Westminster Abbey, made this pathetic note: "There was to be remarked among the spectators a venerable old man whose intrepid services I could have wished had also been rewarded by some flattering marks of public gratitude." That man was William Murdoch, and his only memorial south of the Tweed is a bust by Chantrey in Handsworth Church, the resting-place of those three great men—Watt, Boulton, and Murdoch. Until recent years, all that Murdoch's native country could boast of was a portrait of him in the hall of their Royal Society, of which he was a Fellow. It was on the initiative and by the exertions of the North British Association of Gas Managers that a bust was placed in the Hall of Heroes, in the Wallace Monument, and under the same auspices a gas-engine was presented to the Glasgow University, for use in its laboratory, as a memorial to the inventor of coal gas. It still remained for the Scottish people to erect a more public monument to that great inventor and most worthy man.

Extension of Water Gas on the Continent.—We learn from the "Journal de l'Eclairage au Gaz" that water gas is included in the contracts which have been entered into in connection with the gas supply of Chartres, Nantes, St. Quentin, and Valence. In the same publication it is stated that plant on the Dellwik-Fleischer system is to be introduced at Dortmund, Salzwedel, and Stuttgart.

WELDLESS STEEL PIPES FOR GAS AND WATER.

The question of the use of steel pipes has not secured the general attention among British gas and water engineers that might have been expected or that the experience with them on the Continent warrants and the intrinsic merits of the pipes deserve. But now greater consideration is being directed to them by engineers in this country for the two purposes in which we are concerned; and in one case recently, a considerable length has, we believe, been laid for the conveyance of gas under high pressure. For some years on the Continent, the Mannesmann weldless steel spigot and faucet tubes have been used by gas and water suppliers; and testimony covering a prolonged period completely corroborates all the commendatory points submitted by the British Mannesmann Tube Company, Limited, in bringing the subject of their use prominently before British engineers.

The steel pipes supplied by the Company are solid drawn; and, while the jointing is done in the same way as in the case of cast-iron pipes, there is a special feature about it to which attention is called. If the illustration is consulted, it will be seen that the ends of each pipe are slightly bell-mouthed and closed respectively, so that, while there is no fear of wedging into the socket, a wedged joint is formed when the lead is properly caulked. In connection with the question of joints, there is another feature—that is, in a long length of main, their number is considerably reduced, as compared with cast-iron pipes. The steel pipes are made in lengths ranging from 6 feet up to 35 feet; and thus, not only is the advantage of a minimum of joints secured, but there is the saving effected in the labour and material used in making the joints. Celerity in laying is also gained by—as was done lately in one case for gas-supply purposes—making the few joints in a length, say of 100 feet, on the surface, and then lowering it into the trench. Among other features to which importance is attached, are the lightness of the pipes (being about one-third to one-half less than the weight of a cast-iron main of the same length), and the consequent economy in handling and transport. It follows that the material being of a higher tensile strength and having greater ductility, the shells are made thinner than in the case of the mains with which they are competing. To prevent possible deterioration from outside influences—such as moisture or acidiferous soils—the pipes are covered with tar-soaked jute cloth, which is proved to be an absolute protection. This detail is referred to again later on. It should also be pointed out that the sockets (when required) are made with a thicker shell than the tubes, in order to avoid vibration in the process of caulking; and, in the larger sizes, they are strengthened by means of an over-socket shrunk on hot.



For an example of the decrease in thickness, take a tube of $4\frac{1}{2}$ inches internal diameter D, the thickness of the tube d is $\frac{7}{16}$ inch; the external diameter of the tube $4\frac{3}{4}$ inches; the internal diameter of the socket D_1, $5\frac{1}{2}$ inches; the packing-space f, $\frac{5}{16}$ inch; and the depth of joint T, $3\frac{1}{2}$ inches. The same qualities—the higher tensile strength and greater ductility—are a recommendation from the points of view of the protection they afford in distribution systems against breakage from subsidence or heavy vehicular traffic, and the shallower excavation required. Pipes of this kind should therefore be extremely valuable in undermined districts and in made-ground. Confirmatory evidence that they are so is found to have been given by, among others, the Administration of the Magdeburg Gas and Water Works. In writing on the subject, after having had 2 to 6 inch tubes in service for about ten years, and in places where the old filled-up fortress ditches had not, even up to a comparatively recent date, permanently settled, it was stated that there had been no breakage of the tubes or any leaking of the joints. There, too, 2-inch tubes were found to be excellent for the purpose of gas connections to houses and lamp-posts.

The list of merits is not completed yet; two or three others still claiming notice. The first one—and it is of importance—is that the pipes can be bent cold on the spot without trouble; and this statement is verified by remarkable testimony from Brussels, to the effect that tubes have been bent there, in a cold condition, to a curve of 75° radius. There is another quality attributed to the Mannesmann pipes, which must assume increasing importance in these days of the wholesale adoption of electric traction, and the laying down of electricity supply systems in all towns of any condition. The tubes (as mentioned above) are covered with tar-soaked jute cloth, as well as coated inside with a special solution prepared by the Mannesmann Company, who report that their experiments have proved this method of covering and coating to be a splendid insulator and a perfect safeguard against electrolytic action. The covering and coating appear to be imperishable, seeing that one water-works engineer testifies to there being "no sign of variation" after seven years' use in samples of the tubes inserted in a main laid close to the sea-shore, and consequently

constantly under water. Equally satisfactory results are reported from other quarters.

Cost is a question which will weigh greatly with gas engineers; and, on this point, some highly interesting figures (which are well worth the attentive regard of all concerned) have been compiled by the Mannesmann Company. The figures, of course, are intended to show the relative cost of steel and cast-iron pipes; and, taking the cost of the latter at about £5 per ton, and including in the comparison the cost of the two forms of pipes per foot, cost of jointing material, labour, breakages, trenching, and cost of handling, the total cost of the steel pipes are, until bores of 9 or 10 inches are reached, shown to be well within that of cast-iron ones. If the first cost of the pipes per foot were taken alone, the steel tubes would in most cases represent a greater outlay; but it is the saving in various ways that supervenes on the initial outlay, as set out in the course of this article, that brings the ultimate cost, with the realization of the other advantages, within that of cast-iron pipes—that is to say, accepting as generally applicable the calculations that the Company have made under this head. With so much, and possibly still more, to be said in favour of the adoption of steel pipes, it may be anticipated that greater consideration than heretofore will be paid to them by gas and water engineers in this country.

FROM EARLY VOLUMES OF THE "JOURNAL."

Aug. 10, 1850.

The system of charges, graduated according to consumption, which this Company [the Phœnix Gas Company] has introduced, is a novel one in London, but has been for years in operation in Birmingham, Leicester, Nottingham, Leeds, and most of the large manufacturing towns of Yorkshire and Lancashire, where its action has been found most beneficial. On the scale adopted, the consumer of 24,000 feet per annum will be supplied at 4s. 6d., and at 4s. if his consumption be increased to 48,000 feet a year. Our predilections are rather in favour of the Derby system, where the first 10,000 feet are in all cases charged at the same price; the next 10,000 feet at a reduction of 5 per cent.; and so on in succession up to 60,000 feet. So that the consumer of 500,000 feet pays at the same rate for the first 10,000 feet as the person whose annual consumption is limited to that quantity. These are, however, modifications of the same system, perhaps scarcely worthy of notice here, but which we throw out for consideration to other companies who may contemplate the adoption of similar measures. We have no hesitation in saying that, taking into consideration the cost of coals, labour, and the other elements of the expenditure of a gas-works, and the small consumption over such an extensive district, the price now charged by the Phœnix Gas Company is among the lowest of any in the kingdom.

Sept. 10, 1850.

The general reduction which the price of gas has everywhere undergone during the last two years, has done much to clear away the prejudice which so long obstructed the path of those early labourers in the field of social improvement, who directed the attention of the public to the other domestic uses, besides that of lighting, of which gas was destined to be the medium. Many of our readers in the Midland counties recollect the substantial gas-cooked repasts and ingenious lectures, with which eighteen or twenty years ago Mr. James Sharp (then of Northampton) gratified and instructed the public, demonstrating the advantages of those novel applications of gas which he had in his own family practised for several years previous; and it must be gratifying to him to see their value now so generally admitted. Time and experience may since have modified, and, perhaps, have improved upon, the apparatus then used; but the increasing favour with which the employment of gas for culinary, heating, ventilating, and other processes is now received, is especially due to the reductions which have taken place in the price of the material employed, and to the wearing away of those prejudices which invariably attend the introduction of all innovations upon preconceived opinions. It took at least twenty years to overcome the prejudices existing against the general use of gas for artificial light; and it is, therefore, not surprising that its use for other purposes, less capable of unequivocal demonstration, should have had a similar period of doubt and difficulty to contend with. It has now, however, triumphed over all opposition; and we have lately witnessed the celebrated *chef* of the gastronomic art regaling his guests with a monster joint of 565 lbs. in weight, cooked in an extempore oven in five hours by 750 cubic feet of gas, the produce of 1½ cwt. of coal, with a loss of only 11¼ lbs. in the weight of the cooked joint, and the dripping and osmazome collected. Nor have its advantages for domestic cooking been less significantly demonstrated, as hundreds of families and public establishments can now testify that, in the quality of the viands, as well as in cleanliness and in economy, the new system is incomparably superior to its antiquated rival.

We have been induced to draw the attention of our readers to this subject from the conviction that therein lies the chief source of the future prosperity of gas companies. With the same mains, and with but slight additions to the apparatus required for the night lighting, a large increase of revenue may be derived, solely by finding full employment for that portion of the capital expended in main pipes which is dormant and unproductive during twelve hours out of the twenty-four. Only one-tenth of the total quantity of coal annually imported into London is at present employed in the production of gas for light, and nine-tenths are therefore used for generating heat in some form or other, of which a large portion is consumed in culinary and other domestic operations. Some idea may thus be formed of the field which is opened to the gas manufacturer; and as it is capable of demonstration that 9250 cubic feet, the produce of a ton of Newcastle coal, may be so applied in the kitchens both of the rich and of the poor as to produce the same effect as three, if not four, tons of the same coal when wasted, as they now are, in an ordinary kitchen range, it is quite evident that the interest of gas companies, as well as the public, must be materially advanced by promoting and facilitating the employment of gas for such purposes.

Gillard's Water and Platinum Gas.—The water and platinum gas can be adapted to any existing gas-works, with very trifling modifications. M. Gillard professes to produce more than 6500 cubic feet per 24 hours with only 1 cwt. of charcoal, and with an ordinary retort. The gas is generated by the introduction of steam into the retort over a layer of incandescent charcoal. An inch pipe is connected with the steam-boiler employed on Mr. Kurtz's works [at Hulme, Manchester], and thence runs to the back of the retort-furnace, passing underneath the fire-bars, and up the front of the furnace, to a common ⌂ retort, 1 foot in diameter. A ¾-inch pipe is then carried the whole length of the interior of the retort, upon supports 4 inches high. The underside of this tube is perforated with three rows of fine and closely arranged holes. The retort having been brought to a white heat, the bottom is covered with charcoal, which soon reaches a state of incandescence, and the steam impinging upon it is decomposed, forming pure hydrogen and carbonic acid, which, passing through lime, leaves the hydrogen free. This gas, which has been known for half-a-century, is useless for illumination when consumed in the ordinary way; it is the means employed which constitutes the principal part of M. Gillard's invention. It can be applied both as light and as fuel. If as fuel, it can, from its almost perfect purity, be burnt in the very centre of a room, the temperature of which it raises in a very short time to 18° or 20° C. Indeed, M. Payen, a member of the French Institute, and professor at the Conservatoire des Arts et Métiers, positively asserted, in the concluding lecture of his course last April, that it was the most perfect system of heating that could be devised, inasmuch as not one particle of the caloric need be lost by the consumer. Of course, the Gillard gas is easily applied to many industrial purposes, such as the singeing of calico, the smelting of iron, &c.; and last, though not least enticing for the ladies, to cookery. If used for lighting, the gas is made to pass through a kind of argand burner, surmounted by a platinum wire wick, something like net-work. It consists merely of a cage of very fine platinum wire on a small brass frame, fitted on to an argand burner in such a manner that the top reaches a little above the dull hydrogen light, which, the instant the platinum cage is applied, is converted into a globe of intense white light over the whole surface of the gauze, with an appearance of an inner flame rising rather above. The light is perfectly pure; and by it the shades of green and blue can be accurately distinguished. M. Gillard is not only making arrangements for lighting Mr. Kurtz's house throughout, but for warming it by this gas, hydrogen being well known to give out intense heat; and for cooking, M. Gillard affirms that by it he can cook a fowl fit for table in five minutes, and a leg of mutton in a quarter of an hour. It is lighted like ordinary gas, and communicates to the platinum a soft steady light.

The electric telegraph is being adopted to communicate between the station of the Great Central Gas Company at Bow and the central office in the City of London. A copper wire coated with gutta-percha is passed through the gas-main, by which instantaneous communications can be made. At all times, but especially in foggy weather, when the City is enveloped in dense fogs while the suburbs are clear, this ingenious application of the greatest invention of modern days must be of immense utility.

Masonic.—On Thursday last, Bro. Frank C. W. Taylor, the Secretary and Manager of the Shanklin (Isle of Wight) Gas-Works, was installed W.M. of the Chine Lodge, No. 1884, in the presence of a large number of brethren representing the Hampshire and Isle of Wight Province, as well as of personal friends in the gas profession from considerable distances away.

Electrolytic Action on Water-Mains.—In a recent number of the "Zeitschrift für angewandte Chemie," Professor M. Freund described the damage done to cast-iron water-mains in Frankfort. Leakages of water having taken place, the pipes were carefully examined, when it was found that holes had been gradually eaten through them from the outside. These holes were found to be filled with a graphite-like substance, which proved on analysis to be the product of the decomposition of the iron. From laboratory experiments which were carried out, it was made apparent that the destruction of the pipes was caused by an electric current, which it was thought had escaped from the tramway system.

OBJECT-LESSONS FOR GAS STUDENTS.

The pupils attending the "Gas Manufacture" class at Rutherford College, Newcastle-on-Tyne, the formation of which has already been mentioned in the "JOURNAL," have during the session visited, accompanied by the teacher (Mr. Herbert Lees, Hexham), several of the gas-works in the district. The Hendon works of the Sunderland Gas Company were first inspected, and, under the guidance of Mr. C. Dru Drury, the Engineer, a most profitable afternoon was spent. The process of carbonization was made a special feature of this object-lesson, and a variety of forms of furnace were shown and explained to the pupils. Considerable interest was also manifested in the stoking machinery driven by compressed air, as well as in the general arrangement of the works. The next visit was to the Redheugh works of the Newcastle and Gateshead Gas Company, where Mr. T. Hardie, the Manager, kindly placed his services at the disposal of the pupils. The whole routine of gas manufacture was again explained; particular attention being given to the De Brouwer coke-conveyor and to the stoking machinery. Special features of this visit were the opportunity afforded of inspecting a water-gas plant, and the installation of exhausting machinery for sending gas from Redheugh to the large gasholder at St. Anthony's. The most recent visit was one made to the Willington Quay works of the Walker and Wallsend Gas Company. Mr. A. B. Walker, the Company's Engineer, was in attendance, and fully explained the details of the plant under his control. The principal retort-house is on the stage-floor system, and West's manual drawing and charging machinery is used. The coal is conveyed into overhead hoppers by means of an endless bucket arrangement driven by a gas-engine. Two types of regenerative furnaces are in operation; and their characteristic features were pointed out. Other parts of the plant were carefully inspected; and questions asked by the members of the party, and fully and freely answered, elicited much information which will be useful to the pupils in their studies. Visits to other works during the remainder of the session are contemplated. It is gratifying to be able to report that there has been a good and regular attendance at the weekly lectures, and that the interest taken in the work by the pupils gives promise of good results.

Appointment of the Departmental Committee on London Gas.—We have received from the Secretary to the Board of Trade an intimation that the President has appointed Lord Rayleigh, F.R.S. (the Chief Gas Examiner for the Metropolis), Sir William de W. Abney, K.C.B., F.R.S., Dr. Farquharson, M.P., Mr. William King, of Liverpool, and Mr. J. Fletcher Moulton, K.C., M.P., as a Committee "to inquire and report as to the statutory requirements relating to the illuminating power and purity of gas supplied by the Metropolitan Gas Companies, and as to the methods now adopted for testing the same, and whether any alteration is desirable in such requirements or methods, and, if so, whether any consequential alteration should be made in the standard price of gas." Lord Rayleigh is the Chairman of the Committee, and the Secretary is Mr. Herbert C. Honey, of the Board of Trade. At the meeting of the London County Council to-day, the Parliamentary Committee will ask to be authorized to conduct the Council's case before the Committee.

The Keith Light in Germany.—At the annual congress of the Association of Gas, Electrical, and Water Engineers of the Rhineland and Westphalia, held in Cologne on the 23rd ult., at which about 200 engineers from practically all parts of Germany assembled under the presidency of Herr Borchardt, the Manager of the Remscheid Gas-Works, a lecture on the Keith light was delivered, at the request of the Association, by Herr Alfred Fröhlich, a Civil Engineer of the city. It was illustrated not only by diagrams on an enlarged scale, but by means of a complete apparatus in miniature (worked for the occasion by a small hot-air motor heated by a gas-jet) placed in front of the lecturer. By this means, samples of the lights of 150, 300, and 1000 candle power in single burners were shown in action with dazzling effect, even in the daytime. This was especially the case with the 1000-candle power single burner, consuming something less than 30 cubic feet of gas per hour, which size was shown for the first time in Germany.

The Gas Industry in Portugal.—Dr. H. Mastbaum, of Lisbon, in the course of a review, in a recent number of the "Chemiker Zeitung," of the chemical industries of Portugal, gives some interesting particulars of the gas-works in that country. He mentions two works at Lisbon, and one each at Oporto, Coimbra, Santarem, Setubal, and Evora. One of the Lisbon works has attached to it a tar and liquor works under separate management. In Lisbon and Oporto, however, the electric light is extensively used, as well as in many small towns having water power readily available, and in factories with steam power. In many of the smaller places, especially on the plains, acetylene lighting is being largely adopted. The carbide is imported chiefly from Italy. The coal used for gas making is derived almost solely from England, though recently a few cargoes of Westphalian coal have been received. The total imports of coal amount to upwards of a million tons per annum, and nine-tenths of this quantity comes from Great Britain. The import duty on the better qualities of coal amounts to about 10 per cent. of their value.

ADVANTAGES OF BRITISH GAS LEGISLATIVE ENACTMENTS COMPARED WITH THOSE OF THE UNITED STATES.

Communicated by Mr. JOHN WEST.

It may be interesting to many readers of the "JOURNAL" if I relate an incident in connection with a large gas undertaking that came to my notice when journeying in America.

In 1902 among other places, another gentleman and myself visited the City of Cleveland, and called upon my old friend Mr. Greenough, formerly of Boston, and a gentleman well known and highly respected by many gas engineers in this country—he having attended several meetings of the Gas Institute. He now occupies the important position of President of the Cleveland Gas Company. He was very pleased to see us; and, after inspecting his large works, we learned that he had called together most of the gas engineers in the immediate district to entertain and pay honour to his visitors during the evening.

At this happy gathering, as will be imagined, we discussed gas matters pretty generally in connection with the New and the Old Country. I gathered that the Cleveland Gas Company at the time was in a very prosperous condition, having had large increases for many years past in the consumption of gas for cooking, heating, and lighting purposes; and the President was then considering the necessity of extending his plant, so as to meet the probable increased demands and requirements in this large and prosperous manufacturing centre, which contains about 425,000 inhabitants. The gas supplied was of about 18-candle power, and was sold to the consumers at 75 c. per 1000 cubic feet, which is a very low figure for America. Something like 15,000 cooking stoves were fixed; and the Company were exceptionally busy in this department—in fact, as I have said before, everything in connection with this important concern appeared in a most flourishing and prosperous condition. But there can be little doubt that at this very time arrangements had been, or were being, made to attack the town by the emissaries of the great Standard Oil Trust, as I learned shortly afterwards that an application had been made for authority, which, unfortunately, had been granted by the Municipality (through the special influence of the Mayor of the town), to supply natural gas to the city for cooking and heating purposes only. Although Mr. Greenough addressed the Council on the subject, and tried in every way to prevent this introduction, he was unable to do so.

There is no natural gas in the immediate district. Therefore it could hardly be expected that this gas would ever become a competitor in Cleveland. Distance, however, does not appear to have been a barrier in this case; for the Standard Oil Trust have, at considerable expense, laid down pipes for the transmission of the gas between West Virginia and Cleveland—a distance of no less than 208 miles. These pipes are made of steel, and are 16 inches in diameter; the gas being delivered through them at a pressure of about 250 lbs. per square inch. It is then reduced, in high-pressure mains, to about 25 lbs. per square inch, and is finally brought down by governors to about 4 oz. pressure in the distributing-mains. To my surprise, I found, when visiting the city, about three months ago, that some 300 miles of mains for supplying the natural gas had already been laid.

This natural gas, as many readers are well aware, is of a much higher calorific value than ordinary coal gas, and is supplied for heating and cooking and manufacturing purposes only. It is inodorous, and deadly poisonous; and therefore of considerable danger to those who use it. This was a point that was strongly urged by Mr. Greenough when before the Council. The gas is being sold at the present time at 30 c. per 1000 cubic feet; and this low price has induced a considerable number of the old Gas Company's consumers to go over to the new one. And who can blame them (if they care to take the risk), when they can get gas of so high a calorific value for heating and cooking purposes for less than half the price? But what is the effect? The introduction of the natural gas has completely stopped the former annual increases of the old Company; and, at the present time, considerably less gas is being supplied by them than formerly. I am sorry to say that the value of the Cleveland Gas Company's shares has already declined.

The question arises as to what will be the ultimate issue and advantage or disadvantage to the consumer, arising out of the severe competition between the East Ohio Gas Company (which is a branch of the great Standard Oil Trust) and the Cleveland Company. It may be said by some advocates that the introduction of the new venture will be a good thing for the consumer. This may probably be the case for a period; but, in my opinion, it is questionable as to how long the advantage may last. Looking back upon our past experience in this country, we can judge by what has formerly taken place—especially in London, where, in the earlier years of gas lighting, several different Gas Companies had mains running side by side in the same streets, and competing severely with each other—the consumers changing from one company to another as the price varied. We know that the frequent disturbance of the streets which necessarily occurred under this competitive system became intolerable, besides which the running of several mains through a thoroughfare, when one would suffice, was responsible for a reckless waste of

capital. Small wonder, therefore, that the Legislature interfered, and eventually decided it would be far better that only one Company should supply gas within a given and restricted area. Looking over the rules and regulations embodied in Acts of Parliament—stipulating the amount of capital, price of gas, illuminating power, and dividends to be paid—and taking into consideration the history of gas supply since those competitive days, there is no doubt that these properly regulated and restricted monopolies have in the main answered admirably, to the advantage of both the investors in gas companies and the public generally. There is a kind of co-partnership between the companies and the consumers, whose interests are both protected by the Legislature; and I feel sure that, when the authorities in America get more enlightened on this subject, we may anticipate that only one system of supply will be allowed or tolerated in each town—in other words, that a properly ordered and regulated monopoly will obtain, which, if satisfactorily arranged, must be an advantage to all parties concerned.

At the present time in America, where each State makes its own laws, the majority of them are so arranged as not to protect monopolies. The result is that most of the gas companies have to run the considerable risk of unnecessary competition, as well as the peculiar whims and fancies of the local political authorities, who are ever changing, and who generally try to make some monetary advantage wherever they can.

I found that the Cleveland Gas Company paid the Corporation the extraordinary sum of 6½ per cent. upon the sale of gas; and this is undoubtedly done with the idea that the Corporation will do their best to protect the Company, though they could not make any definite promise to do so, as the State laws do not lend their support. Seeing that the Gas Company pay the Municipality 6½ per cent. on their takings for gas, it might be interesting to know what monetary arrangements have been made between the representatives of the Standard Oil Trust and Mr. Johnson, the Mayor, to recoup them for the loss of the 6½ per cent. they will sustain through the reduced receipts of the old Company.

It appears to me that there is no end to the possibilities of this sort of thing. There is no reason why another Illuminating Gas Company should not, under present conditions, go to Cleveland, inasmuch as they would only have to submit their franchise to a popular vote as well as to the City Government; and there is little doubt that they would succeed if they had power and influence enough. This would bring a third party into the arena; and then there would be more fighting and capital squandered. The strongest would be then left in possession; and who but the public would be called upon to pay their little bills.

There is, however, the State of Massachusetts, who seem to be more advanced than the other places in regard to this question; both the gas and electric lighting companies being protected in the State to this extent: There is a Commission (appointed by the Governor) to whom the Companies have to make returns of their business, and who have control of the prices charged by them. A competing company would have to secure the assent of the Commission before they could do business, as they protect gas and electric light companies to this extent.

Some of the gas companies, like some of the large Trusts in the States, are very much over-capitalized or valued; and this, of course, prevents gas engineers selling gas cheaply. This system of "watering" in the great Trusts in America is, in my opinion, doing an incalculable amount of harm to the country. Mr. Carnegie (who is noted for giving advice) admits that they will have to squeeze some of the water out of these Trusts. It struck me when reading this remrrk that it would have been much better if he and those connected with him had never permitted the great Steel Trust to have had such a deluge of water poured into it, which has already caused the ruin of a large number of the shareholders.

It is said that it is a good thing to see what other countries are doing, and how they manage their affairs. During my visit to the States, I certainly was impressed with the advantages of some of the Educational methods and workshop practice; but, when judging their ways in connection with gas and electric light company enterprise and practice, and especially in connection with the gas supply, I felt that the system adopted in Great Britain is very far in advance of theirs. All gas companies with Acts of Parliament in Great Britain should feel glad that they are in a country where there is greater security and protection for their investments, and that these regulated Acts of Parliament are of considerable advantage to the public generally.

[Mr. Greenough last summer was very much upset by bereavement in his family; and he visited Europe to recruit his health. When last I saw him, he had not fully recovered. But I heard from him a few days ago; and his friends will be glad to know that his health has been fully restored.]

It is rather curious that, almost coincidently with the announcement of the constitution of the Board of Trade Committee on the Gas Supply of London, with Lord Rayleigh as Chairman (to which reference is made elsewhere), the gratifying news was circulated that he had been appointed a Knight of the Prussian Order of Merit for Science and Art. The Chief Gas Examiner, who is the third baron (the peerage having been created in 1821), is a Justice of the Peace, and has been Lord Lieutenant of Essex since 1892.

SULPHATE OF COPPER AND CONDENSING GAS-STOVES.

Communicated by Mr. F. R. E. Branston.

When the products of combustion which ensue from the ignition of ordinary coal gas are passed through galvanized sheet-iron tubes, fitted into cast iron, for the purpose of producing the action of condensation, the sheet-iron tubes will, after a short space of time, be found to wear out; but the iron castings will not be acted on in like manner. When copper or brass tubes are substituted for the galvanized sheet-iron tubes, a different action takes place, as copper being a better conductor of heat than cast iron, the heat is carried down to the base of the apparatus (which should be kept quite cool), and the iron castings in the base will be found to quickly wear out. Copper being a more costly metal than iron, it is generally found that the tubes used for the purpose are so thin that they are easily dented and damaged in transit—causing defects which can only be remedied by taking the apparatus to pieces at considerable cost.

The principal objection to the use for this purpose of copper and brass tubes may, however, be found in the chemical action which is set up in the interior of the apparatus, by which sulphate of copper can be produced, as after stoves of this kind with copper tubes have been in use some little time, when taken to pieces, considerable quantities of sulphate of copper will be found in the interior parts, and the copper tubes will be covered with verdigris.

When these stoves are made so that the products of combustion are partly condensed, and partly allowed to find their way out through the tubes in the form of vapour, as described by Mr. H. Leicester Greville in a recent article on the subject of these stoves in the "Journal" for the 12th ult., the sulphur separated by the stove showed a large percentage up to a certain point, when it commenced to decrease. That is to say, when vapour commenced to rise from the stove, caused by increased consumption of gas and the consequent increased temperature of the stove, the products of combustion escaped with the vapour, and the condensed water would, of course, decrease as the vapour increased in proportion to the consumption of gas. The point at which the vapour and products of combustion commence to escape is easily determined by holding a hand glass over the orifice of the columns, when, if no moisture is discernible, it may be taken for granted that the apparatus is working within its capacity. The observations made by Mr. Greville were taken many years back, but would apply equally well if they had been taken quite recently.

Tests of the Carron condensing gas-stove (which is so constructed that the products of combustion or vapour are not allowed to escape from the apparatus) were recently carried out by the "Lancet;" and their report reads as follows: "The result of this arrangement is that a maximum amount of condensed liquid is obtained; and, according to our analysis, this liquid contains a very appreciable amount of sulphur in the form of combined sulphuric acid. In one experiment we obtained 13 oz. of fluid after the stove had been working six hours; the total gas consumed being 48 cubic feet—that is to say, approximately, 1 oz. of fluid is obtained from 3 cubic feet of gas consumed. On analysis, this fluid was found to contain 7 grains per gallon of sulphuric acid (SO), which is equal to about 3 grains of sulphur per gallon. There is thus an important amount of sulphur washed out of the products of combustion; and, as sulphur compounds are the most objectionable products of the combustion of coal gas, this result is decidedly a favourable feature of the stove."

Some of the products of the combustion of coal gas are sulphuric and sulphurous acids, which are absorbed by the condensed water produced by a condensing apparatus which is working properly. But oxygen combines with the metal to form an oxide; and the sulphuric acid and oxides unite to form sulphates. Sulphate of copper is occasionally found, crystallized with sulphuret of that metal; but it would be much more common in the condensed water, which also acts on the iron castings. The old copper tubes taken from these stoves, having been found to be green with verdigris, and lumps of copper sulphate having been found deposited in them, it is manifest that brass and copper are not suitable metals with which to construct the tubes of condensing gas-stoves, that galvanized sheet iron is unsuitable as it so quickly wears out or perishes, but that cast-iron tubes are the most lasting, and the most suitable for the purpose.

The only place where copper is in any way suitable as a metal for use in the construction of condensing gas-stoves is when it is used as a reflector behind the burner, and does not in any way come in contact with the products of combustion. One of the principal objects of constructing a condensing gas-stove with tubes, is that the products of combustion, by passing through them, may be cooled, and the heat which is given up pass to the surrounding air by radiation. But when polished copper or polished brass is used for the purpose, this object is in a great measure defeated, as the heat is retained, and the action of condensation is impeded, as metals with polished surfaces do not radiate heat in the same proportion as they do when they are rough and black.

It may be stated that the polished metal tubes, by presenting a bright appearance, are likely to attract attention among other

stoves; but this consideration cannot carry much weight in their favour, as in that case they are merely taking a place like the large old-fashioned bottles in a chemist's shop window, which being full of some coloured poisonous liquid, may attract attention, but are quite unfit for daily use.

This system of gas warming-stoves, which commenced its existence in very large proportions—being from 6 to 7 feet high—has for many years defied all attempts to dwarf it, without loss to its efficiency resulting therefrom; so to counteract what was lost in this direction, artistic ingenuity of a peculiar kind was enlisted, which developed a style of polished metals and bright colours, smeared with gold paint, which is supposed to suit the taste of the customers of the gas companies, but which caused the system to run imminent risk of ending its existence like some poisonous foreign toy. Having now passed through its period of evolution —of resemblance to the pump, the retort, and the chemical condenser, to what has been described by Professor Lewes as the "most highly decorated"—it has at last emerged in a form, on a convenient scale, combined with efficiency, which may secure for it a leading place among the most effective appliances for extending the use and the sale of gas.

THE USE OF FLUELESS GAS WARMING-STOVES.

Communicated by H. Leicester Greville, F.I.C., F.C.S.

In an article which was recently published in the "Journal" (*ante*, p. 85), I reviewed the general question of the use of a particular type of gas-stove, with special reference to the possible production of incomplete combustion products, and the separation and condensation of sulphur compounds. In the present communication, I propose to deal with what might perhaps be more legitimately termed the sanitary and economic aspects of the question. An inhabited room heated by a flueless gas-stove has two sources of pollution to the air which it contains—that from human beings, and that from gas. In the case of perfect gas combustion, the products in a good condensing form of stove would be carbon dioxide and water vapour, with a small but varying proportion of sulphur dioxide. In the case of human beings, we also have carbon dioxide and water vapour, as the emanations from the lungs, but accompanied with more or less noxious organic exhalations, the effects of which are practically unknown beyond the fact of their being of an unhealthy character.

Both the living organism and the stove are thus dually interfering with the normal and healthy condition of the atmosphere, by abstracting oxygen and evolving carbon dioxide, with the advantage in favour of a good gas-stove that its products are at least free from gaseous organic matter. The average products of the complete combustion of normal gas can be easily calculated from its composition. The products emanating from an average human being are also known from many practical experiments. We can thus ascertain the effects of gas and of humanity on the atmosphere, assuming fixed data as a basis of estimation.

For the present purpose, let us assume a room of fair size, such as 12 ft. by 15 ft., with a height of 10 feet, and thus having a capacity of 1800 cubic feet. Such a room may be termed of medium size. Let the source of heat be a condensing gas-stove consuming 8 cubic feet of gas per hour. Professor Lewes has given, in his lecture to the Institution of Gas Engineers at their meeting in June last, the following as the normal composition of London 16-candle gas by volume:—

	Per Cent.		Per Cent.
Hydrogen	54	Benzene	1
Methane	34	Carbon monoxide	6
Ethylene	3		

The calorimetric value was stated as 623 B.T.U. On combustion, we have the following equations:—

$2H_2 + O_2 = 2H_2O$	1 vol. needs 0·5 O.
$CH_4 + 2O_2 = CO_2 + 2H_2O$	1 ,, ,, 2·0 ,,
$C_2H_4 + 3O_2 = 2CO_2 + 2H_2O$	1 ,, ,, 3·0 ,,
$2CO + O_2 = 2CO_2$	1 ,, ,, 0·5 ,,

I have omitted benzene, as it is so small in quantity that for the present purpose it can be taken as ethylene. Therefore, 100 cubic feet of the gas requires as follows:—

H	54 × 0·5 =	27 of O.
CH_4	34 × 2·0 =	68 ,,
C_2H_4, C_6H_6	4 × 3·0 =	12 ,,
CO	6 × 0·5 =	3 ,,
Total		110 of O.

One cubic foot of gas requires, therefore, 1·1 cubic foot of air for complete combustion. In this it forms 0·48 cubic foot of carbon dioxide. Consequently, 8 cubic feet of the gas would require 8·8 cubic feet of oxygen, equal to 44 cubic feet of air, and give 3·84 cubic feet of carbon dioxide.

The combustion of 8 cubic feet of gas at 623 B.T.U. per cubic foot gives a total heat value of 4984 B.T.U., representing pounds of water raised 1° Fahr. This heat is presumed to be employed in raising the temperature of 1800 cubic feet of air. The specific heat of air may be taken as ·238. The heat which would raise 4984 lbs. of water 1° Fahr. would thus raise 20,950 lbs. of air through the same range. A pound of air would measure 13·1 cubic feet; so that the 20,950 lbs. would measure 274,445 cubic feet. This represents the volume of air which would be raised theoretically 1° Fahr. by the combustion of 8 cubic feet of gas. We are, however, dealing with the effect of temperature on 1800 cubic feet. The amount of heat which would raise 274,445 cubic feet 1° Fahr. would raise 1800 cubic feet to 152° Fahr. This represents the total theoretical effect. The modifications occurring in practice will be dealt with later on.

Turning to the physiological aspect of the question, Dr. Parkes, in his "Practical Hygiene," states that the average man expires per hour 16·66 cubic feet of air, containing 4 per cent. of carbon dioxide. He also states that normal air contains only 0·04 per cent.; and he arrives at his supply of fresh air on the basis of reducing the carbon dioxide in a living-room to this limit. The 16·66 cubic feet of expired air would thus require a dilution of 100 times its volume; and the amount of fresh air per hour for each person would be 1666 cubic feet. Allowing for organic exhalations, he considers that 0·25 per cent. should be added, raising the amount to some 2000 cubic feet. Assuming our hypothetical room to contain two persons, these should be supplied with 4000 cubic feet of fresh air per hour.

Reverting to the question of gas, the 44 cubic feet of air necessary for combustion have parted with their oxygen so as to leave 35·2 cubic feet of nitrogen, to which must be added 3·84 cubic feet of carbon dioxide—making a total volume of 39 cubic feet. The proportion of carbon dioxide in this would be 9·8 per cent. The quantity of fresh air necessary to reduce this to the limit of 0·04 per cent. would be 9600 cubic feet. We have, therefore, as fresh air per hour—

For two human beings	4,000 cubic feet.
For the gas	9,600 ,,
Total	13,600 cubic feet.

The heat from the combustion of the gas has, therefore, to warm 13,600 cubic feet of air. The rise of temperature in this case would be theoretically about 20°—say, from 40° to 60° Fahr.

Among practical circumstances to be considered must be, on the one hand, the evolution of heat by the living organisms, and, on the other, the heat absorption by walls and articles of furniture. The abstraction of oxygen from the air by breathing and by the combustion of the gas has not been taken into consideration, as the quantities involved in proportion to the main question are comparatively small. Moreover, slight alterations in the amount of oxygen in the air do not seem to have a deleterious effect on living organisms; whereas constant inhalation of air vitiated by comparatively small quantities of carbon dioxide produces a distinctly noxious action. It should be noted that the limit of 0·04 per cent. may be largely exceeded; and Dr. Parkes quotes from 0·15 to 0·3 per cent. only as producing symptoms of headache, vertigo, &c. He considers, however, that injurious effects may ensue below these limits by the breathing of air vitiated by respiration; but he states that part of such effects may be due to the presence of organic impurities.

In conclusion, it would seem that a good condensing gas-stove might be reasonably used as an effective source of heat in a well-ventilated room. In fact, the products from gas and from human beings are so similar, that the presence of too many of the latter in a badly-ventilated room would give rise to a more insalubrious atmosphere than would be the case with a smaller number of people *plus* a good gas-stove.

Association Meetings and Affiliation.—We have received from Mr. H. Kendrick, of Stretford, the Honorary Secretary of the Manchester District Institution of Gas Engineers, a forecast of the proceedings at the forthcoming meeting, which, in all probability, will be held on Saturday, the 20th inst. This is earlier than usual; but the Committee are anxious to "set the ball rolling" in connection with the question of the affiliation of the District Associations with the Institution of Gas Engineers. The Committee had the matter under consideration last Friday; but it is apparent there are certain difficulties in the road, or matters upon which additional explanation is required, as their deliberation closed without any final decision being arrived at. Further consideration of the matter is to take place at another meeting next Friday, when it is hoped that a definite line of action will be reached. It will be remembered that the Committee have, in accordance with the resolution passed at the November meeting, to submit the matter to the general body of members before committing the Institution to the idea one way or the other. However, this will form one of the several interesting features promised for the meeting in Manchester. There will also be the Inaugural Address of the new President (Mr. H. Townsend, of Wakefield), and probably papers by Mr. J. G. Newbigging and Mr. Kendrick. In all likelihood, too, the programme will include an inspection of the gas-engines and testing-plant at the British Westinghouse works, Trafford Park. A preliminary notice issued by the Honorary Secretary of the Midland Association of Gas Managers (Mr. A. Cooke, of Oldbury) informs the members that their annual meeting will be held on the 25th inst. There will be the Inaugural Address of the new President (Mr. George Helps, of Nuneaton), which, we believe, promises several points of interest; and it may be surmised that affiliation will also form one of the topics for consideration.

GAS POWER FOR ELECTRIC CENTRAL STATIONS.

In the "JOURNAL" for the 19th ult., we gave some extracts from a paper on "Gas Power for Operating Electric Central Stations in Connection with Gas-Works," presented by Mr. J. R. BIBBINS at a meeting of the American Institute of Electrical Engineers. The following is the concluding portion of the paper, the full text of which was given in "Progressive Age."

Station Economy.—Returning to the consideration of the plants under exhibit [*ante*, p. 154], the average station economy observed is shown in Table I. Averages for several months' operation have in most cases been given, so that the results represent the efficiency of the entire station day by day with generating outfits running at varying load factors, and including errors of measurements encountered in every-day operation. Though in some cases "over-dynamoed," the engines are generally underloaded, and frequently so much so that good economy could hardly be expected. The average gas consumption per kilowatt-hour is 39 cubic feet. Assuming an average calorific value of 625 B.T.U. per cubic foot for coal gas, water gas, or mixed gas, the heat consumption is 24,400 B.T.U. per kilowatt-hour, 18,200 B.T.U. per engine horse-power-hour, and 14,500 B.T.U. per brake horse-power-hour. The average cost of gas charged to the engine is 33·9 c. per 1000 cubic feet, which is in nearly all cases considerably above the cost in the holder to companies operating both plants, with the result that the gas-works realize a handsome profit from the electric station, in addition to the decrease in cost per unit with increased production. This point will be brought out later. Assuming an average production cost of 20 c. per 1000 cubic feet, the average cost of power is 0·83 c. per kilowatt-hour, equivalent to 0·0495 c. per brake horse-power-hour at 80 per cent. combined efficiency. The following are the characters of the load on the several plants: No. 1, railway; No. 2, arc; Nos. 3, 4, 6, 8, 9, and 10, incandescent; Nos. 5 and 11, incandescent and arc.

TABLE I.—*Cost of Operation* (*Fuel Only*).

Plant Number.	Kind of Gas.	Per Cent. of Total Gas Generated Used for Engines.	Manufacturing Cost of Gas. Cents per 1000 Cub. Ft.	Cost Charged to Engines. Cents per 1000 Cub. Ft.	Gas per Kilowatt-Hour at Switchboard.	Cost per Kilowatt.		Remarks.
						Gas only. Cents.	Steam Station. Per Cent.	
1	Mixed .	54·0	18	37·57	43·75	1·65	..	Av. 6 months.
				28·40	1·07	81·0		All day run.
				at 18	46·57	0·84	63·5	Gas at co t.
2	Coal .		18	18·00	33·64	0·61	24·5	Av. 4½ months.
3	,, .	31·0	..	62·00	53·20	3·30	..	Av. 6 months, 1902.
4	Water .	30·0	..	59·30	41·60	2·46	..	Av. 20 months, 1901-2
5	Mixed .	37·5	..	34·60	..	..	..	Output not metered
6	Coal .	26·0	..	39·80	48·40	1·93	..	Av. 9 months, 1902.
8	,, .	5·0	19	33·00	28·50	0·94	..	Night run 65 per cent. rating
9	Mixed .	19·5	..	29·50	41·70	1·22	..	Av. 6 months, 1902.
10	Coal .	15·0	..	20·00	41·90	0·98	..	Av. 19 da. Aug., 1902.
11	Natural	100·0	10	15·00	12·40	0·18	..	Special test.
			10	16·00	21·50	0·34	26·0	Av. 6 months.
	Average . . .			33·90	39·00	1·40		

Note.—The average cost per kilowatt-hour, with gas at 20 c. (excluding No. 11), was 0·828 c.; the average number of cubic feet of gas per kilowatt-hour, 39.

The comparative cost of steam and gas power is well shown in Tables II. and III. In Table II., two independent stations were operated during 1902, together with the gas-works. The cost of coal in the steam plant was $1·38 per kilowatt-hour, against 75 c. in the gas plant; representing a saving of 45·5 per cent., though the cost per 1000 B.T.U. of gas was 3·4 times the cost per 1000 B.T.U. of coal. Assuming the calorific values of 14,000 and 625 B.T.U. per pound and cubic foot respectively, 92,000 B.T.U. were required per kilowatt-hour in the steam-station, against 29,100 B.T.U. in the gas-station, or a saving in the latter of 68½ per cent. In Table III., the output was not measured, but the costs indicate the general balance of economy on the side of the gas station. The steam plant started on natural gas at 10 c. per 1000 cubic feet with a minimum expense of $3000 per annum. It employed horizontal return tubular boilers fired by gas. One year after starting the gas plant this minimum was reached, and the company are now paying at the rate of more than 16 c. per 1000 cubic feet. The saving in the total operating cost amounted to 40·5 per cent. In the face of a 30 per cent. increase in station output, the gas consumption has been reduced by 93 per cent. Previous to the replacement of the steam equipment, an economy test was run on the station throughout 24 hours. The gas consumption at the boilers was 51·09 cubic feet per horse power developed at the engines, equivalent to about 86 cubic feet per kilowatt horse power. All the engines were of the simple high-speed type running non-condensing. A short preliminary test of the gas plant after installation showed an economy of 12·31 cubic feet per kilowatt horse power. During the six months ending August, 1902, the total gas consumption of the station, including heating, was 23·8 cubic feet per kilowatt-hour. Deducting approximately 7·5 per cent. for heating, the net consumption was 21·5 cubic feet, which is about 24 per cent. of that recorded on the steam-station. It is equivalent to 12 cubic feet per brake horse power, or a duty of 14,100 brake horse power.

TABLE II.—*Comparative Operating Economy* (*Plant No.* 1).

Steam Station, 1250 I.H.P.; Averages for Six Months. (April-Sept.)	—	Gas Station, 685 B.H.P.; Averages for Six Months. (May-Sept.)	
	1902.		1902.
K. W.-H. per month . .	122,733	K. W.-H. per month .	39,508
Lbs. coal	802,507	Cub. ft. gas	1,726,400
Per cent. ash	7·70		
Lbs. coal per K. W.-H. .	6·55	Cub. ft. gas per K.W.-H.	43·75
Cost coal per ton f.o.b. .	$4·02	Gas charged per M.c.f. .	37·67c.
Handling	0·19	Price gas, per K.W.-H. .	1·65
Total	4·21	Cost gas, actual . . .	17·20
Cost coal per K. W.-H. .	1·36c.	Actual cost, K.W.-H. .	0·75
		Per cent. saving cost per K.W.-H.	45·50
W.-H. per lb. coal, a.m. .	134·65	W.-H. cub. ft. gas, a.m.	24·33
Do., p.m.	166·02	Do., p.m.	21·40
Do., 24 hours	159·08	Do., 24 hours. . . .	22·23
B.T.U. per lb., estimated	14,000	B.T.U. per c. ft., estim .	625
W.-H. per 1000 B.T.U., 24 hours	11·35	W.-H. per 1000 B.T.U., 24 hours	35·60
B.T.U. per K. W.-H. . .	92,000	B.T.U. per K.W.-H. .	29,100
B.T.U. per E. H. P. hr. .	68,600	B.T.U. per E.H.P. hr. .	21,700
B.T.U. per B.H.P. hr. at 80 per cent.	55,000	B.T.U. per B.H.P. hr. at 85 per cent.. . .	18,450
		Per cent. saving of heat.	66·50

Note.—Load on steam-station plant, railway, incandescent, and arc; on gas-station plant, railway. The steam-plant embraced compound condensing engines and water-tube boilers, having an average load-factor higher than the gas-station, the plant at which was started on April 1, 1902. Both plants ran from 15 to 18 hours per day.

Special Test.

	All Day Run.		Five-Hour Run.
Maximum watt-hours per cubic foot of gas .	35·30	..	40·90
Cubic feet of gas per K.W. hour	28·40	..	25·00
,, ,, ,, E.H.P. ,, ...	21·20	..	18·60
(1) ,, ,, ,, B.H.P. ,, ...	18·02	..	16·65
(2) B.T.U. per B.H.P.	12,250	..	10,400

TABLE III.—*Comparative Cost of Operating Steam-Engines and Gas-Engines, both Using Natural Gas* (*Plant No.* 11).

Plant.	Year.	Gas.	Labour.	Repairs.	Oil and Waste.	Remarks.
Steam Plant. Gas-Fired Boilers (575 I.H.P.).	1897	$9753·20	$9725·26	$600·00	$1485·06	Gas rate, 10c. per 1000 c. ft. minimum reached in 1900. Aver. 1902, 15·9c. per 1000 c. ft.
	1898	9320·70	8258·33	400·00	306·14	
Gas-Engine Plant (860 B.H.P.)	1899	6318·92	6828·74	239·85	533·56	Increase in Revenue. p. ct.
	1900	3000·40	6782·01	499·09	592·92	1897 } 1898 } . 5·75
	1901	3000·00	7678·83	196·90	407·01	1899. . 7·50
	1902	3000·00	7626·67	261·04	379·70	1900. . 11·00
						1901. . 13·50
						1902. . 18·50
						Increase in Load, 1898-1902. 30 p. ct.

Total for steam plant.	$19,924·34
,, gas-engine plant	11,836·41
Saving	$8,087·93 or 40·5 p. ct.
Cost of steam power per annum per horse power . .	$36·40
Cost of gas power per annum per horse power capacity of station	14·80
Saving.	$21·60 or 59·40 p. ct.

Economy Tests.

Steam-station (1898, 24 hours)—	
Gas per I.H.P. hour	51·09 cubic feet.
,, K.W. ,, ...	86·00 ,,
Gas-station—	
Gas per K.W. hour, average of six months .	21·50 ,,
Calorific value of the gas per cubic foot . .	1175 B.T.U.

The gross station economy in the case of plant No. 6 is shown on Diagram 1. The observations were made when the station was first started, and was operating under an extremely low load

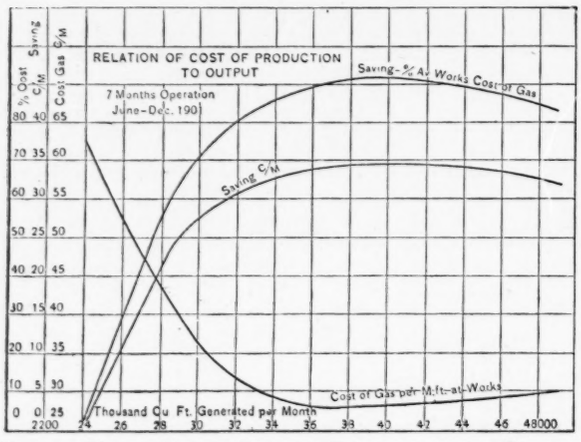

RELATION OF COST OF PRODUCTION TO OUTPUT
7 Months Operation June-Dec. 1901
Saving-% Av. Works Cost of Gas
Saving C/M
Cost of Gas per M.ft. at Works
Thousand Cu. Ft. Generated per Month

DIAGRAM NO. 1.—CURVES SHOWING DECREASE IN THE COST OF MAKING GAS DUE TO INCREASED OUTPUT NECESSITATED BY GAS-DRIVEN ELECTRIC STATION NO. 6.

factor. Diagram 2 gives similar results upon station No. 8, which also operates considerably under the rating. Both diagrams show the decrease in the cost of gas at the gas-works, due to the augmentation in the output necessitated by the electric station. The results may be considered as representative of conditions about as unfavourable to high economy in the prime mover as is usually encountered.

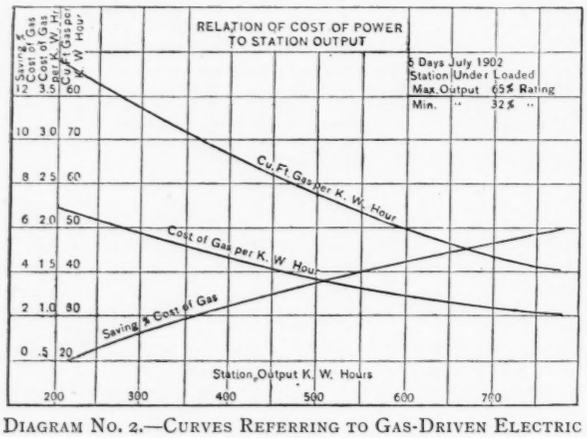

RELATION OF COST OF POWER TO STATION OUTPUT
6 Days July 1902
Station Under Loaded
Max. Output 65% Rating
Min. " 32% "
Cu. Ft. Gas per K. W. Hour
Cost of Gas per K. W. Hour
Saving % Cost of Gas
Station Output K. W. Hours

DIAGRAM NO. 2.—CURVES REFERRING TO GAS-DRIVEN ELECTRIC STATION NO. 8.

In Table IV. is given the operating cost of plant No. 9 for six months during 1902. The average cost of gas is $1·22, and the total operating cost $3·18 per kilowatt hour. Considering this to be a plant of but 135-horse power, these results are good.

TABLE IV.—*Operating Costs of 135-Horse Power Generating Station (Plant No. 9).*

Month, 1902.	K. W. Generated.	Gas to Engines.	Works Cost of Materials per 1000 Cub. Ft.	Cubic Feet per K.W.H.	Cost of Gas per K.W.H.	Total Cost, Labour and Materials.	Operating Cost per K.W.
		Cub. Ft.	Cents.		Cents.	Dols.	Cents.
Jan. . .	5465	187,600	32·20	34·4	1·10	149·07	2·74
Feb. . .	4489	170,700	32·50	37·0	1·20	145·84	3·24
March .	4186	180,200	31·00	43·0	1·34	146·02	3·50
April . .	4670	226,600	31·00	48·5	1·50	168·31	3·61
May . .	5124	227,100	28·00	43·4	1·21	161·70	3·16
June . .	5246	231,300	22·50	44·0	0·90	153·73	2·93
Average.	..	..	29·53	41·7	1·22	..	3·18

Note.—An average of 19·5 per cent. of the total gas generated used by engines.

The foregoing data show in a general way the results that may be accomplished by gas-power plants, even though running under a burden of expense for fuel that would be quite out of the reach of steam plants; and it goes without saying that much better results are obtainable in a plant of considerable size of modern design, and furnished with reasonably cheap fuel gas.

Combined Gas and Electric Stations.—The theory of increase of profits from the operation of combined gas and electric plants is based upon the fundamental principle of reduction in cost per unit, with increased output. If the net saving is sufficient to cover fixed charges upon the electric station, the way is clear to reap a double revenue—one from the electric-station operating at a cost far below its steam-driven competitors, and the other from the gas-station operating at a lower cost of production than before. The balance may, of course, be applied proportionately to the disbursement of fixed charges on both stations. It is usually the gas-station that reaps the profit at the expense of the electric-station. An adjustment of gas and electric rates can easily be made to prevent embarrassing competition.

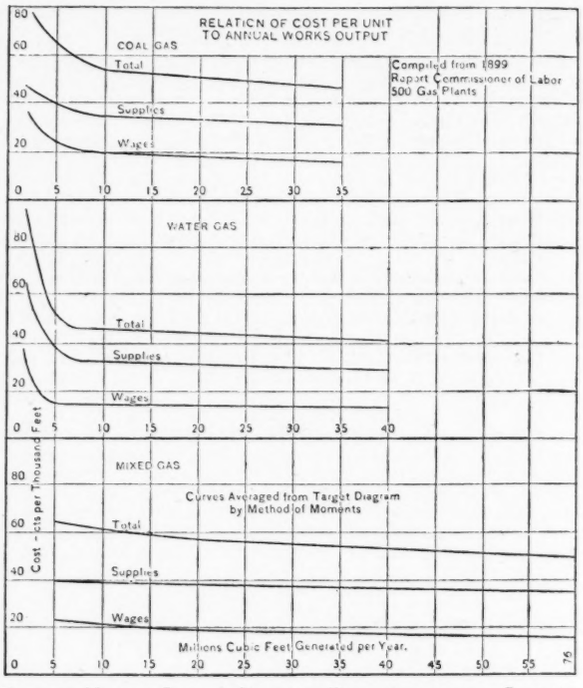

RELATION OF COST PER UNIT TO ANNUAL WORKS OUTPUT
COAL GAS
Total
Supplies
Wages
Compiled from 1899 Report Commissioner of Labor 500 Gas Plants
WATER GAS
MIXED GAS
Curves Averaged from Target Diagram by Method of Moments
Cost - cts per Thousand Feet
Millions Cubic Feet Generated per Year.

DIAGRAM NO. 3.—CURVES SHOWING DECREASE IN THE COST OF MAKING GAS AS THE OUTPUT INCREASES.

Diagram 3 shows the cost of coal gas, water gas, and mixed gas for approximately 500 gas plants in the United States, as given in the report of the Commission of Labour on Gas and Electric Plants for 1899. The curves bring out the following points:—

1.—Cost per unit decreases as output increases; most rapidly in coal-gas plant, and less rapidly in water-gas plants.
2.—Decrease in cost per unit in small plants of 2 to 10 million cubic feet per annum output is very marked; being greatest in water-gas plants, and least in mixed-gas plants.
3.—The greatest opportunity for increasing revenue from combined gas and electric stations appears to be in the case of small coal and water gas plants of less than 10 million cubic feet output; the smaller the plant the greater the profit.

In Table I., plants Nos. 1 to 10 inclusive operate combined gas and electric works, and all successfully. Though the cost of producing gas is not in all cases available, in most cases the power gas is charged to the engine at such a rate as to ensure a handsome profit to the gas-works. Table V. gives results obtained from plant No. 1. In this case, the electric plant was charged with gas at twice the cost of production. The owners of the gas-works also realized a saving of 8·5c. per 1000 cubic feet nominal, or 10·3c. actual, as a result of the increased output due to the gas-engines, which is 60 per cent. of the present cost of production. The total saving thus amounted to 30·8c. per 1000 cubic feet—nearly twice the production cost, and but little less than the cost charged to engines.

Table VI. shows the actual rate of decrease per month. In the last column, the results are reduced to a basis of equal cost of coal—viz., that of 1901. Table VII. gives results in plants where similar data were available. The average saving recorded, due to gas-engines, was 5·2 c. per 1000 cubic feet, or 6·8 per cent. of the works cost, including maintenance, and without deduction for residuals. This, however, is less than the actual saving, by reason of the general increase in the cost of coal at the time the last observations were taken, due to general stringency in the fuel market. A comparison of the then prevailing market prices for fuel with the normal shows an increase of 24 per cent. in coal and 45 per cent. in coke. Applying to Table VII. the percentage difference in saving due to difference in fuel cost observed in plant No. 1—viz., 15 per cent.—the average saving is 7·82 per cent. of the works cost, which is a material saving in any plant. This, of course, applied directly to the gas as distributed to customers.

These results are shown graphically in Diagrams 4 and 5, which represent the saving due to increased production, part of which is traceable to the electric plant and part to consumers. In plant No. 6, a saving of 24 per cent. was realized; and in

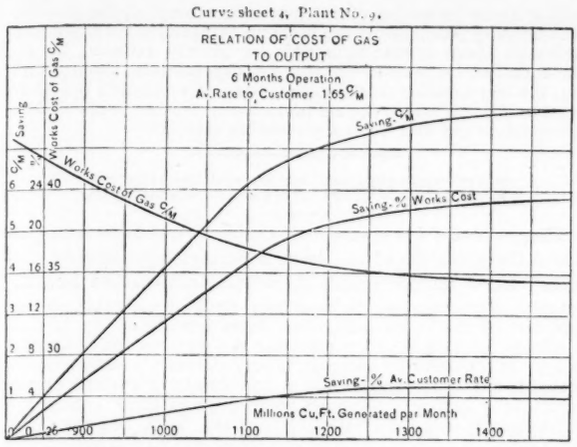

Curve sheet 4, Plant No. 9.
RELATION OF COST OF GAS TO OUTPUT
6 Months Operation
Av. Rate to Customer 1.65 C/M
Works Cost of Gas C/M
Saving C/M
Saving - % Works Cost
Saving - % Av. Customer Rate
Millions Cu. Ft. Generated per Month

DIAGRAM No. 4.—CURVES SHOWING REDUCTION IN THE COST OF MAKING GAS DUE TO MORE CONSUMERS AND GAS-ENGINE STATION No. 9.

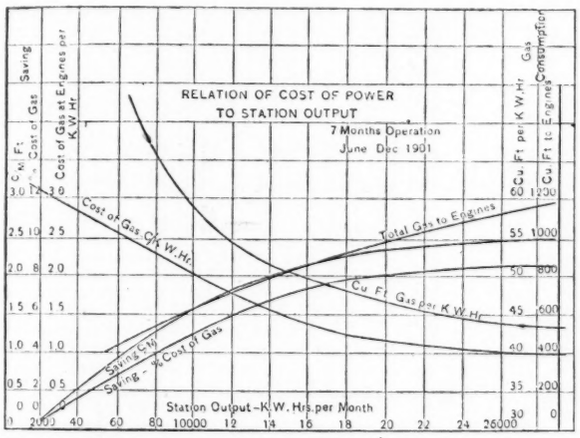

RELATION OF COST OF POWER TO STATION OUTPUT
7 Months Operation
June Dec 1901
Cost of Gas C/K.W.Hr.
Total Gas to Engines
Cu. Ft. Gas per K.W.Hr.
Saving C/M
Saving - % Cost of Gas
Station Output - K.W. Hrs. per Month

DIAGRAM No. 5.—CURVES SHOWING REDUCTION IN THE COST OF MAKING GAS DUE TO MORE CONSUMERS AND GAS-ENGINE STATION No. 10.

plant No. 9, the remarkable amount of 92 per cent. of initial works cost.

In order to bring out clearly the character of this saving due to increased production, the following case has been estimated along the lines already indicated. A 10 million cubic feet plant has been generating gas at 40c. per 1000 cubic feet; the works

TABLE V.—*Profit from the Operation of a Combined Station. (Plant No. 1).*

[A gas-works having a total production during 1901-2 of 38,241,000 cubic feet, or 10,100 cubic feet per ton.]

—	Total.	Cents. per 1000 Cub. Ft.
Expenses—		
Coal, 3780 tons at $4·03	$15,208·70	40·02
Bench fuel	3,381·97	8·82
Labour	2,473·50	6·61
Repairs	676·11	1·63
Miscellaneous expenses	184·90	0·48
Total cost of gas	$21,945·18	57·56
Less residuals—		
Coke, 2375 tons at $6.	$14,250·00	37·20
Tar, 31,750 gallons at 3·7c.	1,172·00	3·18
Total receipts from residuals.	$15,422·00	40·38
Net cost of gas	$6,523·18	17·18

Cost of gas—	
Charged against works, average of four months	$67·15
,, ,, gas-engines ,, six ,,	$37·57
Decreased cost—	
Due to increased production, actual, cents per 1000 cubic feet	5·68
On the basis of equal cost of coal, do.	10·31
In percentage of works cost	15·40
In percentage of engine cost	27·40
Profit to gas-works—	
From engine, cents per 1000 cubic feet	20·39
From greater output, do.	10·31
Total profit due to gas-engines, do.	30·70
,, ,, in percentage of works cost	45·80

TABLE VI.—*Reduction in Cost of Mixed Gas per Unit with Production (Plant No. 1).*

Month.	Gas Made per Month in Thousands of Cubic Feet.		Increase.	Per Cent. Increase.
	1901.	1902.		
April	4115·5	5183·9	1068·4*	26·00
May	3028·2	6612·4	3584·2	118·00
June	3044·1	6845·3	3801·2	125·00
July.	4163·3	7176·6	3013·3	72·50
Aug.	4431·5	7775·0	3343·5	75·50
Average	3666·8	7102·5	..	97·75

* Gas-station operating light for testing out. April results not considered.

Total Cost of Gas per 1000 Cubic Feet Made.				Decrease in Cost. Nominal.		Decrease in Cost at 1901 Coal. Actual.	
—	1901. Cents.	1902. Cents.	Cost at 1901 Coal.†	Cents. per 1000 Cub. Ft.	Per Cent.	Cents. per 1000 Cub. Ft.	Per Cent.
April	62·63	66·59	61·60	3·86	6·15	1·03	1·67
May	65·90	61·91	57·20	3·99	6·45	8·70	13·20
June	68·90	62·67	57·90	6·23	9·05	11·00	16·00
July.	66·47	60·05	55·60	6·42	9·65	10·87	16·35
Aug.	67·40	61·32	56·75	6·08	9·02	10·65	15·80
Average	67·15	61·49	..	5·68	8·54	10·31	15·34

† 1901 coal 3·75, 1902 coal 4·02, free on works.

cost including coal, bench fuel, labour, repairs, and miscellaneous material, residuals not deducted. Fixed charges have purposely been omitted. The gas is charged at the works cost to the electric station. It is assumed that the cost of gas for this plant, previous to absorption of the electric plant, was 50c. per 1000 cubic feet, and that the electric plant generates electricity at twice the fuel cost—3·2c. per kilowatt-hour. During normal operation, with an output to the electric plant of 30 per cent. of the total amount of gas generated, the total net revenue of the combined works was about $13,300, 45 per cent. of which was due to the electric-station; and 55 per cent. to the gas-station. The operating costs will then amount to 46·4 per cent. of the net revenue.

TABLE VII.—*Comparative Cost of Gas as Affected by Production.*

No. of Plant.	Output per Month before Using Gas-Engines.	Output after Gas-Engines were Used.	Increase in Output.	Percentage Increase.	Works Cost of Gas, Including Maintenance, per 1000 Cubic Feet. Saving Effected.			
					Before Gas.	After Gas.	Difference.	Percentage of Gas Generated before Engines were Used.
	Cub. Ft.	Cub. Ft.	Cub. Ft.		Cents.	Cents.	Cents.	
1	3666·8	7102·5	3435·7	97·75	67·15	61·49	5·66	8·54
	3666·8	7102·5	3435·7	97·75	67·15	56·84	10·31	15·34
2	2250·0	3250·0	1000·0	44·50	..	18·00	8—10	..
3	590·0	924·0	334·0	56·50	65·60	63·99	3·06	5·50
6	2192·0	4139·0	1947·0	89·00	42·50	39·80	2·70	6·40
10	..	..	..	50·00	..	..	5·00	..
						Aver.	5·20	6·80

Remarks.—For plant No. 1, the first figures are per month, on an average of four months; the second are estimated on the basis of the 1901 cost of coal. For plant No. 2, the net charges figures are estimated. For plant No. 3, the figures are per month, on an average of eight months. In the case of No. 10, there was a 20 per cent. increased cost of coal. [The figures of works cost of gas and the difference, in the case of plant No. 3, are exactly as given in the paper.—ED. J. G. L.]

The following are the operating costs and profits of a typical gas and electric works; the fixed charges being omitted from the estimate:—

Assumptions.

Output of gas per annum	10,000,000 c. ft.
Gas made per ton	10,000 ,,
Works cost of gas, per 1000 cubic feet	40 c.
Do. before gas-engine was used	50 c.
Cost at engine	40 c.
Coal, cost per ton	$3·75

Coke made* (at $5 per ton)	1230	lbs.
Bench fuel per ton (at $4)	300	,,
Gas tar per ton (at 4·5c.)	8·3	galls.
Line and meter loss, gas line	15	p. ct.
Do., electric system	10	,,
Average price to gas consumer, per 1000 cubic feet	$1·25	
Average rate to electric customer, per kilowatt-hour	12	c.
Electric plant consumption of gas, proportion of total output	30	p. ct.
Gas per kilowatt-hour at switchboard	40	c. ft.
Fuel cost ,, ,,	1·6	c.
Works cost ,, ,,	3·2	c.

Revenue.

Gas—		
To electric plant, 3,000,000 cubic feet	$1,200	
For distribution, 7,000,000 ,,		
For sale, 85 per cent., or 5,950,000 cubic feet.	7,445	
Total from sale of gas		$8,645
Residuals—		
Coke for sale, 465 tons.	$2,325	
Tar for sale, 8300 gallons.	374	
	2,699	
Total sales, gas-works		$11,344
Electricity—		
Kilowatt-hours generated, 3,000,000 ÷ 40	75,000	
Less line loss, 10 per cent.	7,500	
Kilowatt-hours for sale	67,500	
Revenue from electric station		8,100
Total revenue from works		$19,444

Cost.

Gas—		
10,000,000 cubic feet, at 40 c. per 1000 cubic feet	$4,000	
Net revenue, exclusive of fixed charges $7,344		
Electricity—		
67,500 kilowatt-hours, at 3·2c. per hour	2,160	
Net revenue, exclusive of fixed charges $5,490		
Total cost to combined works		6,160
Total net revenue from combined works		$13,284

	Per Cent.
Proportion due to electric-station	44·7
,, ,, to gas-station	55·3
Electric-station percentage of gas-station	81·0

Fixed Charges Omitted from the Estimate.

	Per Cent.
Operating cost, proportion of net revenue—	
Electric-station	36·3
Gas-station	54·5
Works No. 9	46·4

The following is a comparison of costs before and after the installation of the electric-light station:—

Gas-Station.

BEFORE.		AFTER.	
Revenue from gas	$7,445	5,950,000 c. ft., at $1·25	$7,445
,, from residuals	1,890	3,000,000 c. ft., at 40c.	1,200
		Residuals	2,699
Total revenue	$9,335		$11,344
7,000,000 c. ft., at 50c.	3,500		
		10,000,000 c. ft., at 40c.	4,000
Net revenue	$5,835		$7,344
		Increase	$1,509
		Saving—10,000,000 at 10c.	1,000
		Total increase	$2,509
Cost per cent. of net revenue	60	Cost per cent. of net revenue	54·5
		Do. *plus* saving	32·4

Gas and Electric Station.

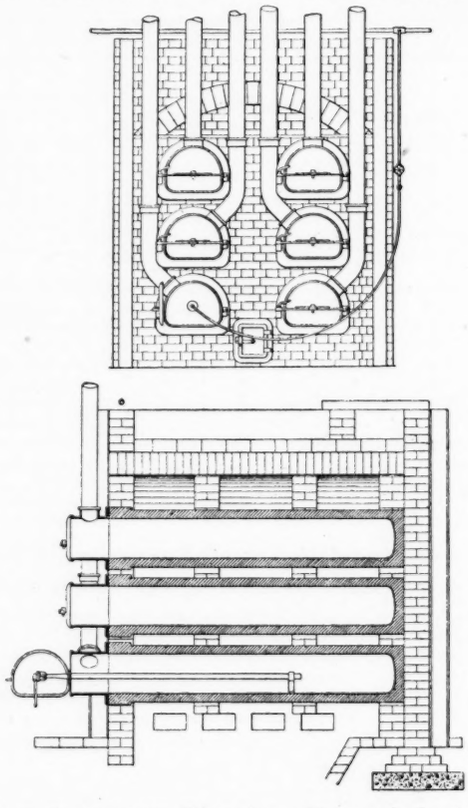
BEFORE.		AFTER.	
Revenue	$9,335	Total revenue—gas, electricity, and residuals	$19,444
Cost	3,500	Cost—gas and electricity	6,160
Net revenue	$5,835	Net revenue	$13,284
		Revenue before	5,835
		Increase	$7,449
		Saving—10,000,000 c. ft. at 10c.	1,000
		Total increase	$8,449
Cost per cent. of net revenue	60	Cost per cent. of net revenue	45·4
		Do. *plus* saving	43·0

Comparing the operation of the gas-station *per se* previous to and following the acquisition of the electric-station, there is a net revenue of $5835 and $7344 respectively—being an increase of $1509, or 25·8 per cent. of the original revenue. Figuring in the saving of 10c. per 1000 cubic feet due to increased production, the total increase amounts to 43 per cent. of the net revenue upon the original gas-station. Considering, finally, the combined works, the increase is $7449, or 127 per cent. of the original revenue; and adding again the saving of 10c. per 1000 cubic feet, the total increase is 145 per cent. of the revenue of the original gas-works. Although these percentages will be greatly reduced by the consideration of investment charges, depreciation, sinking fund, &c., the fact remains that the saving due to combined operation is material, and should appeal particularly to companies working independent gas and electric generating stations.

* In coal-gas plants, the sale of residuals constitutes an important part of the total revenue—so important, in fact, that during times of high-priced fuel it pays to manufacture coal gas rather than water gas, and sell residuals. The average yield per ton of coal is 10,000 cubic feet of gas, 1230 lbs. of coke, and 8·3 gallons of tar.

THE MELDRUM RETORT SCURFER.

There are very few managers of gas-works who have not appreciated the advantage of having at hand some appliance for enabling them to remove quickly the accumulated carbon from the retorts. Various methods have been devised with this object; and one of the latest, which has been introduced by Messrs. Meldrum Bros., Limited, is shown in the accompanying illustrations. It consists of a steam-jet blower properly proportioned to its work, and so arranged that it can be easily applied to any retort in a setting. A 1-inch steam-pipe is fixed behind the ascension-pipes for the full length of the beds, and provided, between each pair of beds, with a T-piece ending in a ¾-inch cock or valve. The scurfer is connected with the steam-cock by means of an armoured or a metallic flexible steam tube sufficiently long to enable the scurfer to reach into the mouth of any retort on the



bed, as shown in the illustration. The usual plan is to fix a length of wrought-iron pipe, from 1½ to 2 inches in diameter, equal to about two-thirds the length of the retort, to the flange on the end of the scurfer. The mouth of the retort is closed by a sheet-iron plate (an old lime lid answers the purpose very well), having in the centre a 2-inch or a 2½-inch hole, according to the size of the pipe. The wrought-iron pipe is passed through the hole up to the flange, and the end allowed to rest on the bottom of the retort, when the apparatus is ready for use. The steam is then turned on, and the scurfer allowed to blow for from 15 to 20 minutes. On the scurfer being withdrawn, the usual cleaning methods may be resorted to.

Tests which have been made with the appliance show that after its use the carbon will come off readily in pieces up to 20 inches long, and even larger, and in good saleable condition; the whole operation—from starting the blowing to clearing the retort of the broken carbon—occupying, we are assured, less than 45 minutes, or less than one-fourth of the time required by the old method. Another advantage claimed for the scurfer is that it can be employed directly after the drawing of a retort, so that the latter is thrown out of use for only a very brief period—a by no means unimportant consideration when the works are pressed. It is obvious that by the use of the appliance described instead of a heavy bar, the wear and tear on the retorts is reduced to a minimum; while the prolonged tax upon the physical force of the workmen in the face of intense heat, which was a necessary concomitant of the old system, is dispensed with. For this reason the scurfer is keenly appreciated by the men.

REGISTER OF PATENTS.

Lighting Devices for Incandescent Gas-Burners.—Keith, J. & G., of Farringdon Avenue, E.C. No. 4518, Feb. 26, 1903.

This invention relates to devices of the kind referred to in patent No. 11,644 of 1902, for lighting incandescent gas-burners by means of an electric spark through the intervention of a bye-pass pilot-light. The present improvements have for their object to provide an independent tap for the bye-pass and means for automatically opening it to ignite the pilot-light when the burner-cock is turned on, and to close it off when the burner is lit. The original proposals of the patentees were described in the "JOURNAL" for Dec. 30, 1902, p. 1749.

In lieu of arranging the plug of the main tap to admit gas for the pilot-light, and fitting it with a spring to turn the cock and cut off the bye-pass, an independent gas-passage is provided for the pilot-light; and it is fitted with a small tap which is normally held in the closed position by means of a spring, which may be much lighter than would be required for turning the main plug. On the bye-pass tap is fitted a projecting arm, which carries a terminal wire or blade so as to make contact with an insulated terminal or wire secured on the tap body in proximity to the climbing pilot lighting tube; and these wires are brought into contact to produce an electric spark on turning the bye-pass tap, by the action of a projecting arm on the main cock lever on a "trip" lever on the bye-pass plug. The arm and "trip" lever are so positioned that, on turning the main cock lever to admit gas to the burner, the bye-pass cock is also turned on against the power of the spring, and the spark produced to ignite the pilot-light; and as the main cock is fully turned on, the arm on its operating lever clears the trip lever on the bye-pass cock, so that the spring immediately acts to turn back the bye-pass cock and cut off the gas supply for the pilot-light.

Gas-Pipe Unions.—Cotton, G., of Holmes Chapel. No. 5005; March 4, 1903.

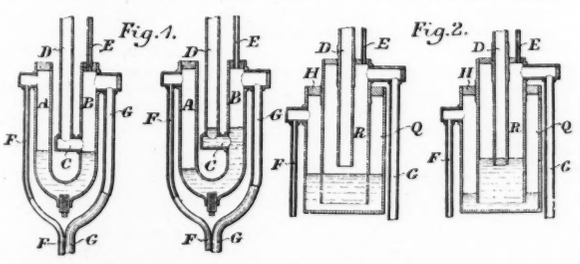
This invention refers chiefly to the unions as used for connecting gas supply-pipes to meters; and its object is to so form the union as to enable an official to so seal the same that, except by breaking the seal, the supply-pipe cannot be disconnected—thus affording a safeguard against unauthorized disconnection.

The union is formed in the ordinary way, but upon the part which connects to the meter is mounted a nut, collar, or ring, of a diameter corresponding to the size of the coupling nut on the part which connects to the pipe; and in the periphery of this additional ring or nut is formed a recess (preferably simi-circular), and in the periphery of the coupling nut is a like recess—the two recesses forming a complete circular recess. When the pipe is coupled up and the joint made tight, the half recesses are brought opposite each other, and into the circular recess thus formed a wax seal is impressed, so as to act as a key for preventing the nuts or collars being separated until it is actually broken.

Lighting and Extinguishing Gas-Burners from a Distance.—Johnson, J. Y.; a communication from Friedrich Siemens, of Dresden. No. 5060; March 4, 1903.

This invention relates to a device by which gas-burners provided with pilot-lights can, by means of compressed air, be lighted or extinguished from a central station by operating liquid contained in valves so that increase of pressure extinguishes the flame, while decrease of pressure ignites it. Fig. 1 represents in vertical section one form of the device, showing the position of the liquid when gas is admitted to the burners and when the supply to the burners is cut off. Fig. 2 shows vertical sections of a modification.

In fig. 1, the syphon which acts as a container for the liquid is constituted by a U-shaped tube, the legs A and B of which are closed at their upper parts. Into the leg A opens the compressed air pipe F, and into the leg B opens the gas supply-pipe G. In the leg B is an opening C, with which communicates a tube D supplying gas to the



burners. The upper part of the leg is fitted with a small tube E, which constantly supplies gas to the pilot-lights. The bent tube A B contains mercury, or other suitable liquid, in quantity sufficient to normally leave the opening C free, so that the gas flows from the pipe G through the leg B, opening C, and tube D, to the burners, and is ignited by the pilot-lights. When the pressure of the air in the pipe F is increased, the mercury is forced down in the leg A and up in the leg B, thereby closing the opening C, so that the supply of gas to the burner is cut off and the lights are extinguished—the supply of gas to the tube E not being cut off and the pilot-lights therefore continuing to burn. If the air pressure be again decreased (or destroyed in consequence of a leakage), the mercury descends in the leg B, and allows the gas to enter the opening C and pass to the burners by the tube D.

In the arrangement shown in fig. 2, the container for the liquid is formed by a cylindrical casing Q, which is connected with the compressed air-pipe F, and has passing through its cover H a short tube R connected to the gas-piping G at a point preferably above the cover, and extending nearly to the bottom of the casing Q. The adjustable tube D supplying gas to the burner is screwed through the cover closing the upper end of the tube R until the lower end of the tube D is at a suitable distance above the bottom of the casing. Into the casing so much mercury is introduced as will normally leave the end of tube D open. The cover of the tube R is provided with a small tube E supplying gas to the pilot-lights, so that its opening is never closed by the mercury. When the mercury occupies the level shown in the left-hand view, gas flows through the pipe G and tube D, and is ignited by the pilot-lights, which are constantly supplied with gas from the tube E. If the pressure in the compressed air-pipe F be increased, the mercury is forced down in the casing Q and up in the tube R, thereby closing the opening to the pipe D so that the supply of gas to the burners is cut off and the lights extinguished—the supply of gas to the small tube E remaining uninterrupted. If the pressure in the compressed air-pipe be diminished or destroyed from leakage, the mercury descends in the tube R, and gas can pass again into the tube D.

The distance between the opening of the tube D and the normal level of the mercury may be different in the devices for different groups of burners or lamps, so that those in which the distance is least are extinguished when the minimum increase of pressure takes place in the air-pressure pipe; a further increase of the air pressure causing the mercury to ascend into the tube R to such a level that a second group of lights is extinguished, and so on. In this manner, a given number of lamps, or of separate burners in lamps containing several burners, can be extinguished, and the rest allowed to remain lighted until extinguished by a further increase of the air pressure. The adjustment of the distance can be effected by raising or lowering the surface level of the mercury by allowing some to run out, or by pouring some more into the apparatus. This mode of adjustment can be made use of in the constructional form of the burner shown in fig. 1. The adjustment can also be effected by altering the position of the opening of the tube D by screwing the tube up or down.

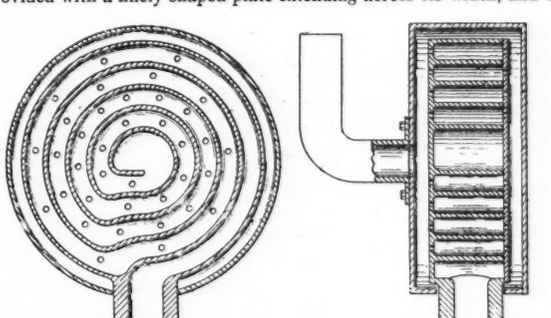
Construction of Mantle for Incandescent Lighting.—D'Heureuse, R., of Berlin. No. 5080; March 4, 1903.

This invention—relating to the construction of a fabric, to be used as an incandescent mantle, by interweaving a system of threads which cross one another in such a way as to be retained in as straight a line as the form of the mantle and the crossing of the thread will allow—was sufficiently described in the "JOURNAL" for Dec. 22, p. 747.

Silencing the Exhaust of Gas-Engines.—Crawford, B., of Auckland, New Zealand. No. 6200; March 17, 1903.

The principle upon which this invention is based consists in causing the exploded gas to travel spirally through a special chamber, the spiral course in which is provided with a number of small holes in its sides at intervals throughout its length—such holes aggregating in area the cross sectional area of the exhaust-pipe; and some of the gas escapes through these openings in a number of small puffs as it travels through the spiral course. The inner end of the spiral is made without any holes in its sides, so that an elastic cushion is thus formed in the centre of the spiral, against which the main body of the exploded gases will strike and rebound, so as to pass out through the holes in the sides of the spiral.

As shown, the appliance consists of a chamber of cylindrical form provided with a finely-shaped plate extending across its width, and in

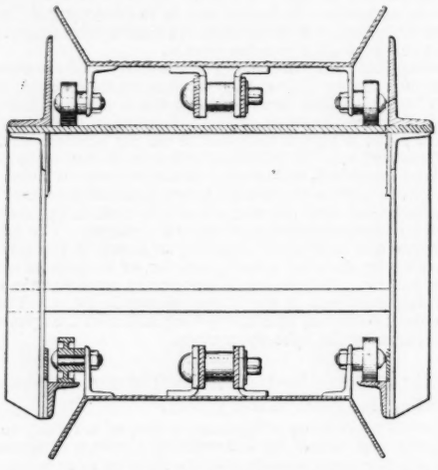


length from near the periphery of the chamber to its centre. A spiral course is thus formed in the chamber leading from its outer edge to the centre. A pipe-connection leads into the outer end of the spiral, and this connection is adapted to have secured to it the exhaust-pipe from the engine. The sides of the chamber are formed with apertures arranged at intervals throughout the length of the spiral, and aggregating an area equal to the cross-sectional area of the exhaust-pipe of the engine. The exploded gases are discharged through the exhaust pipe into the outer end of the spiral, and are forced through it, so that a portion of the gases will be divided off and will get out through the apertures as they pass round the spiral. The greater part of each explosion will, however, be delivered into the centre of the spiral, where a cushion of air, or air and gas, will be formed, and will then be broken up so as to pass out through the apertures in the sides of the chamber. The cushion of air or air and gas formed in the centre of the spiral will be always maintained by the working of the appliance, so that the explosion in striking against the cushion will be deadened and emerge from the apertures in a number of small streams.

Hot-Coke Conveyors.—Little, A. J. S. B., of Smethwick. No. 11,180; May 16, 1903.

This hot-coke conveyor consists of an endless belt of iron or steel plates linked together and provided with rollers at intervals, which run along the bottom of a water trough and pass over end drums and return

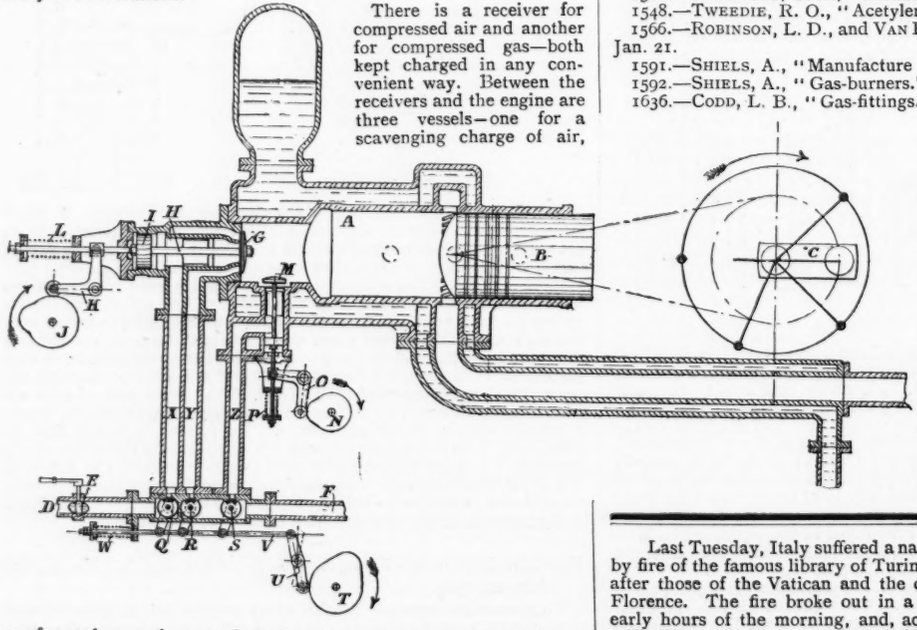
underneath the trough; the hot coke falling on to the plates, and by them being conveyed and delivered over the end of the trough. Heretofore, owing to the fact that the plates have been flat, the rollers (which are situated underneath the plates and are carried by them to run along the bottom of the trough) cannot be utilized to carry the return chain of plates underneath the trough, because the rollers are now on the top and the plates immediately beneath them, and there is not sufficient room for any rails or guides between the plates and rollers for the rollers to run along. This defect is obviated by the present invention. The parts are so arranged that the rollers which carry the plates are utilized not only for supporting the top strand of chain in the water-trough, but also to carry the return part of the chain underneath the trough.



In carrying out the invention, the sides of the coke-carrying plates are bent upwards (as shown) so as to leave a space between the rollers and the side portions of the plates. The rollers arranged below the upturned sides of the plates revolve on axle-pins fixed to, or formed as parts of, brackets fixed to the underside of the plates and at the sides of them, so that the rollers project underneath the upturned sides of the plates as shown. The rollers are of such a size that, when they run along the bottom of the trough, the links will clear the same, as will readily be understood. Underneath the water-trough, and parallel with it, and at a suitable distance below, are two angle section or other guide rails carried by brackets arranged at suitable intervals apart and fixed to the underside of the trough. These guide rails are so located as to occupy the space between the peripheries of the rollers and the upturned sides of the plates just underneath the rollers, so that the rollers will travel along them; the empty carrying plates, with their upturned sides, being situated underneath these guide rails, while the rollers which carry the plates run along the top. Thus the rollers serve the double purpose of carrying the endless belt of plates in the water-trough and also the return strand of the plates underneath the trough.

Gas-Engines.—Davey, H., of Princes Street, S.W. No. 24,371; Nov. 10, 1903.

This invention relates particularly to gas-engines having one impulse every revolution; but it is also applicable to engines having an impulse every two revolutions.



There is a receiver for compressed air and another for compressed gas—both kept charged in any convenient way. Between the receivers and the engine are three vessels—one for a scavenging charge of air, one for a charge of gas, and another for a charge of air. The two latter charges come together on entering the cylinder and form the explosive charge. The three vessels have capacities proportioned to the cylinder capacity, and are charged from the receivers during the explosion period of the engine revolution. The air and gas in the receivers is kept at the required pressure by means of air and gas pumps worked either from the engine or some other source of power; the effect being that the explosive charge is measured into the cylinder by the vessels, and the proportion of air and gas maintained nearly, if not quite, constant. Mechanism is provided by means of which the air and gas passing from the vessels to the cylinder may be cut off earlier or later, with the result of varying the amount of explosive charge admitted; the mechanism being placed under control of the governor.

By this system, several gas-engines may be worked from a common supply of compressed air and compressed gas stored in receivers and conveyed to the engines in pipes; while the measuring vessels preserve a nearly constant proportion of air and gas, although the absolute quantity of explosive mixture may be varied by the operation of the governor.

A is the cylinder in which works the piston B, connected in the usual way by a rod to the crank C. D is a pipe leading gas under pressure to the engine, and in which is a throttle valve E adjustable by hand. The pipe F leads air under pressure to the engine. G is the inlet valve, to the spindle H of which is attached a balancing piston I, so that the valve is in equilibrium and requires a minimum effort for opening and closing. This valve is actuated by a cam J (driven from the engine), which acts on a bell-crank lever K connected to the valve-spindle H. A spring L keeps the valve G on its seat.

Q, R, S, are three valves worked by a cam T (driven in any convenient method from the engine), which acts on the lever U and rod V connecting all three valves. A spring W is attached to the rod V, and keeps the end of the lever U against the cam T. The valve Q is the gas-valve, and admits gas to the pipe X and then to the back of the inlet valve G. The valve R is an air-valve, and admits air to the pipe Y and thence to the back of the valve G. The air and gas, however, do not mix till the valve G opens. The valve S is an air-valve, and admits air to the pipe Z and thence to the scavenging valve M.

The mode of action is as follows, assuming the piston B to be at the end of its inward stroke: A mixture of air and gas is compressed into the space between the piston B and the inlet valve G. This is then ignited by any suitable means. Under the force of the explosion, the piston moves forward, and at the end of its stroke uncovers the exhaust port. As soon as the piston B starts uncovering the port, the scavenging valve M is opened by the lever O and cam N, and a charge of air rushes into the cylinder A and sweeps out the burnt products through the exhaust port. The piston B then returns, the valve M closes, and immediately the exhaust port is closed the inlet valve G is opened (by means of the cam J and lever K), and air and gas from pipes X and Y rush into the cylinder A. The inlet valve G remains open for a portion of the stroke, and is then closed. The piston B continues advancing, and compresses the mixture into the end of the cylinder A. The mixture is then ignited, and the same cycle occurs again. During the explosion stroke—when both inlet valve G and scavenging valve M are closed—the three valves Q, R, S, are opened by the lever U and cam T. These admit gas and air under pressure to the pipes X, Y, Z. They are then closed before the exhaust takes place, and the pipes named are then full and act as receivers.

APPLICATIONS FOR LETTERS PATENT.

1304.—Kay, M., "Atmospheric burners." Jan. 18.
1365.—Talbot, B., "Regenerative furnaces." Jan. 19.
1387.—Graetz, M., "Inverted incandescent lamps." Jan. 19.
1393.—Johnson, J. Y., "Manufacture of coal gas." A communication from the Deutsche Continental Gas Gesellschaft and J. Bueb. Jan. 19.
1421.—Rose, A., and Bellamy, W., "Flame spreaders." Jan. 19.
1506.—Inkpen, R. S. & G. C. V., "Gas-engines." Jan. 21.
1511.—Beaumont, T. A., "Incandescent burners." Jan. 21.
1548.—Tweedie, R. O., "Acetylene torch." Jan. 21.
1566.—Robinson, L. D., and Van Praag, D. J., "Acetylene burner." Jan. 21.
1591.—Shiels, A., "Manufacture of gas." Jan. 21.
1592.—Shiels, A., "Gas-burners." Jan. 21.
1636.—Codd, L. B., "Gas-fittings." Jan 22.
1640.—Gauge, A., "Anti-vibrators." Jan. 22.
1656.—Wood, E., "Mantle preserver." Jan. 22.
1687.—Booth, J., and Raybould, A., "Gas-lamps." Jan. 22.
1696.—Hudler, J., "Incandescent gas-light." Jan. 22.
1709.—Jenkins, W. J., "Charging gas-retorts." Jan. 22.
1719.—New, A. G., "Internal combustion engines." Jan. 23.
1723.—O'Hare, J., and Hodgson, E., "Incandescent fittings," Jan. 23.
1737.—Cummings, C. W., "Incandescent burners." Jan. 23.
1738.—Whitfield, C., "Manufacture of peat gas." Jan. 23.

Last Tuesday, Italy suffered a national calamity in the destruction by fire of the famous library of Turin, which ranks in importance only after those of the Vatican and the celebrated Laurentian Library of Florence. The fire broke out in a room on the third floor, in the early hours of the morning, and, according to the correspondent of "The Times" in Rome, was probably caused by a defect in the electric apparatus.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

The Vertical Retort at Exeter.

SIR,—Mr. H. Leicester Greville, referring to your recent special article on "The Coming of the Vertical Retort," raises the interesting question of the composition of the crude gas as manufactured by the Settle-Padfield process, compared with that obtained in the usual way, and asks if any experiments have been made. In reply, I may say that the point was under consideration at the time when I made the tests already published; and it was recognized that an investigation embracing not only the impurities named, but also naphthalene and the illuminants, would be likely to yield some interesting information. But there was a difficulty in getting a fair sample even of one whole charge. The small holder used in connection with the experimental set only contains 400 cubic feet, so that in working off 2 cwt. of coal two-thirds of the make must be wasted or turned into the works' mains. Even if a sample of one whole charge could be obtained, there might be individual characteristics connected with the particular working that would induce risk of error. It was, therefore, decided that experimental research in this direction had better stop until the bed of six retorts (now in process of completion) was put to work, as samples of gas taken direct from the foul main, from the six retorts, would give a fair average composition.

But it may be mentioned that the gas in the experimental set was always found in my experiments to give no absorption with potash solution, though only one lime purifier containing about 10½ cubic feet of lime was used, and this quantity has at times been employed for over twenty tests of 2 cwt. each—*i.e.*, for 25,000 to 30,000 cubic feet of gas. It is well known that bisulphide of carbon and naphthalene are, to some extent at any rate, products of what Professor Lewes has aptly described as "over-baking;" and one advantage of this process is that it minimizes, if it does not completely remedy, all troubles due to this effect. I therefore venture the opinion that the chemical examination when carried out will show—

(*a*) In the crude gas—
less sulphuretted hydrogen and carbonic acid,
less carbon bisulphide,
more ammonia.
(*b*) In the purified gas—
less naphthalene.

As I have already stated, the experimental retort and set which up to the present has been the only available method of testing the process is to a great extent of a home-made character, rigged up of odd material at hand, and as such fails to give the process full justice; and for this reason it appeared that any elaborate researches with it would only be a waste of time. I am well aware of the dangers of prophesying; but I think most of the engineers who have inspected the set in question will agree with your article that even better results may be expected from the set of six.

N. H. HUMPHRYS.

Salisbury, Jan. 29, 1904.

Reduction in Price.—The Directors of the Aldershot Gas and Water Company have decided to reduce the price of gas to ordinary consumers in the town to 2s. 8d. per 1000 cubic feet, and to those in the out-districts to 3s. 8d., dating retrospectively from the reading of the meters for the last quarter.

Gas-Works Extensions at Shipley.—The Gas Committee of the Shipley Urban District Council met last week to consider the tenders sent in for the fire-clay and iron work required in the completion of the second half of the inclined retort installation. Mr. William Newbigging, Consulting Engineer to the Council, expressed regret that Messrs. Jenkins, of Retford, who had so satisfactorily carried out the contract for the first half of the installation, were not again the lowest tenderers. In view, however, of Messrs. Drakes' undoubted ability to carry out the contract successfully, he recommended the acceptance of their tender, which was the lowest received. The Committee agreed with the recommendation, and accepted Messrs. Drakes' tender. Messrs. Hartley and Kemplay, of Shipley, are the Contractors for the masonry.

South African Water Supply.—There are four huge storage reservoirs on Table Mountain—two for the supply of Wynberg, and two for Cape Town. Wynberg has now a supply of water in excess of its current requirements, and Cape Town is fairly well off; but some of the suburbs are only indifferently supplied. It being necessary to provide a reservoir for them, a site was selected on the slopes of the mountain above Newlands Drive, at a height of 370 feet above the sea level. The reservoir has been formed by carving out from the mountain slope a solid ledge 960 feet in length and 200 feet in width. The next step was to build a great concrete wall, and to pack up the excavated earth outside. The wall is 25 feet high, and when finished it will contain 23,000 cubic yards of concrete, while 180,000 cubic yards of excavated earth will be packed round the inner rim. The thickness of the outer earthworks ranges from 40 feet at the surface to 150 feet at the base. If the work is continued at its present rate of progress, it will be completed by next September. About £300,000 has been already expended, and a further outlay of £50,000 is necessary. The present supply of water has been obtained from an old circular reservoir; and the question has been asked where the water is to come from to fill the new one, which will hold 30 million gallons. It is proposed to bring it from the mountains. The demand for water in the Cape district is steadily growing. When the present Water Board took over the water-works in June, 1900, 4013 houses were supplied; now the total has risen to 6367, exclusive of Woodstock No. 1 district. Since acquiring the works, the Board have laid 9½ miles of mains.

LEGAL INTELLIGENCE.

SUPREME COURT OF JUDICATURE—COURT OF APPEAL

Tuesday, Jan. 19.

(*Before the* LORD CHIEF JUSTICE, *the* MASTER OF THE ROLLS, *and Lord Justice* ROMER.)

Mayor and Corporation of Northampton v. Ellen.

This was an appeal by the plaintiffs from the judgment of Mr. Justice Bigham, delivered on Aug. 4, 1902, on a special case stated for the opinion of the Court.* The plaintiffs claimed from the defendant, who is a ratepayer of the borough of Northampton, a sum of £1 4s 9d.; being a quarterly instalment of the annual water-rent for the supply of water for domestic use to his dwelling-house at Kingsthorpe, a district which had formed part of the area of water supply since 1861, and was incorporated with the borough by the Northampton Extension Order, 1900. The above-named total was made up of £1 0s. 3d., being 7½ per cent. on the rateable value of his house, and 4s. 6d. extra charges for bath and water-closets. The defendant disputed the payment of the £1 0s. 3d. From the commencement of his occupation of the house until June 24, 1901, he had paid a water-rate of 7½ per cent. on the net rateable value of the premises. In 1900, the boundaries of the then borough were extended so as to include the part of Kingsthorpe in which the house was situated. Article 36 of the Northampton Extension Order, 1900, was as follows: "The general district rates to be levied in the added part of . . . Kingsthorpe . . . shall not in any one year, during a period of ten years from the commencement of this Order, exceed such an amount in the pound as, when added to the poor-rate and the borough-rate and any other rate made by the Corporation in the same year, will, in respect of the assessment of any hereditament included in any such rate, make up . . . in the case of the added part of Kingsthorpe a total rate of 5s. 6d. on each pound of the rateable value of such hereditament." From the commencement of the Order, the rates levied in the added part of Kingsthorpe (other than the water-rate) were 5s. 6d. in the pound. Until June 24, 1901, the plaintiffs continued to demand a water-rate of 7½ per cent. per annum upon all consumers, both in the old borough and the added parts. On that date, however, they reduced the rate from 7½ to 5 per cent. per annum in the case of consumers within the old borough, but retained the 7½ per cent. in the case of those in the added part of Kingsthorpe. This differentiation was effected in accordance with a recommendation of the Town Council to the effect that the deficiency so created was to be met out of the district-rate; and as that rate for this purpose would only be chargeable within the old borough, it was obvious that the reduction ought to apply only to the old borough until such time as the rates on the newly added portions ceased to be differential. There were in these parts a number of residents who did not take the plaintiffs' water for domestic purposes, and whose property was therefore not subject to the payment of water-rate. The plaintiffs contended that they were entitled to refrain from reducing the water-rate there, inasmuch as the ratepayers, not being liable to an increase in the district-rate for a period of ten years (which period had not yet elapsed) would bear no part of the extra burden that might be thrown upon that rate in the old borough by reason of any deficiency resulting from the reduction. The defendant contended: (1) That the water-rate was a rate within the meaning of the above-cited article of the Extension Order, and that, inasmuch as the poor, borough, and general district rates payable by him amounted together to the maximum of 5s. 6d. in the pound fixed by the Order, the plaintiffs were not entitled to recover from him the sum of £1 0s. 3d., or any other sum in respect of the water-rate. (2) In the alternative, that, if he was chargeable with a water-rate, the plaintiffs were not authorized to demand of him a higher one than that claimed in respect of domestic consumers in the old borough, taking a supply under similar circumstances—the differentiation of the water-rate as effected by the plaintiffs being contrary to the terms and intention of the Order, not being authorized by the Acts of 1861 or 1884, under which the Corporation supplied the water, and being in breach of the general law of the realm; and he claimed that the plaintiffs were bound to place all domestic consumers in the borough on an equality, save in so far as express statutory powers might sanction. (3) That the plaintiffs were not authorized to estimate for a deficiency on the water account as they had done for the reasons given by them, either accompanied or not by the differentiation. The questions submitted for the opinion of the Court were: (1) Whether the plaintiffs were entitled to differentiate the water-rate. (2) Whether they were entitled to demand a water-rate of the defendant within the period of ten years from the commencement of the Order, so long as the rates payable by him, exclusive of the water-rate, amounted to 5s. 6d. in the pound. (3) Whether they were entitled to reduce the water-rate for the purpose of creating a deficiency. If the Court answered the above questions, more particularly the first, in the affirmative, judgment should be entered for the plaintiffs; if in the negative, for the defendant. In answer to the first question, Mr. Justice Bigham held that the plaintiffs had no power to differentiate the rate. With regard to the second, he held that the water-rate was not a rate to be taken into consideration in making up the total of 5s. 6d.; and he accordingly answered the second question in the affirmative. To the third question he replied in the negative. He accordingly gave judgment for the defendant. The plaintiffs appealed.

Mr. C. A. RUSSELL, K.C., and Mr. RYLAND ADKINS appeared for the plaintiffs; and Mr. HORACE AVORY, K.C., Mr. FORDER LAMPARD, and Mr. BERNARD CAMPION represented the defendant.

The LORD CHIEF JUSTICE said the case was one of some importance, because Mr. Justice Bigham's judgment was a clear and simple decision that, by reason of section 36 of the Northampton Corporation Water-Works Act, 1884, the plaintiffs had no power to differentiate the

* See "JOURNAL," Vol. LXXX., p. 406.

water-rate. This was a decision of importance, and was one which had been on several occasions suggested in other circumstances, but had never until the present case received judicial sanction; and he (the Lord Chief Justice) was very anxious to see if the reasons given in the judgment for that conclusion were founded upon the considerations urged before them by Mr. Avory on the appeal—viz., that there must be equality of charge for the supply of public commodities, such as water, in the same way as there must be equality of charge in the case of the poor-rate. Having briefly reviewed the points raised in the case, his Lordship proceeded to deal with an argument advanced by Mr. Avory, that the effect of only charging 5 per cent. for water in the old part of the borough was that a larger sum in respect of a deficiency in the water account would have to be borne by the general district-rate, and that, therefore, there would be greater probability of the 5s. 6d. being maintained as the total rate to be levied in Kingsthorpe, the inhabitants of which would be thereby deprived of the chance of the rate being reduced below that figure. He was wholly unable to see how this question could be raised. The defendant did not say that the charge for water made upon him was not a lawful one. He only said that the plaintiffs could not reduce the rate in the old part of the borough, and that the grounds for lowering it alleged by them were not valid. Unless the defendant could maintain the ground upon which Mr. Justice Bigham decided the case—viz., the necessity for equality of charge—he was not entitled to place himself in the position of a ratepayer who complained that the conduct of the Corporation was *ultra vires*. Coming to the main point in the case—whether the plaintiffs could differentiate the water rate, and whether the fact of their doing so made the rate bad—he pointed out that a water consumer was entitled, under the Act of 1861, to enter into a contract for his supply of water on such terms and conditions as might be agreed upon. If a consumer was enabled to make an agreement the effect of which would be that he would pay less for his supply of water than other consumers, this would, his Lordship said, destroy, to a great extent, the foundation of Mr. Avory's argument. It was submitted that section 36 of the Act of 1884 imported the obligation of equality of charge, and that the effect of this was to make an unequal charge bad. He was unable to take this view. The only effect of the section seemed to him to be to alter the statutory mode of payment prescribed by section 49 of the Act of 1861, and to introduce into the calculation the net rateable value of the dwelling-house. It was impossible to say that section 36 overrode the powers of the Corporation, by virtue of their being the successors of the Water Company, to enter into agreements with customers as to the supply of water. The contention of the defendant that, though the £1 os. 3d. was due from him, yet by some arrangement, either public or private, the Corporation charged other consumers only 5 per cent., seemed to him to be no defence to the action. In his opinion, therefore, the ground upon which Mr. Justice Bigham decided against the Corporation—viz., that they had no right to differentiate the charge—was bad, and the appeal must be allowed. With regard to the second question raised in the case, he agreed with the learned Judge in the Court below that the words of article 36 of the Extension Order, "and any other rate made by the Corporation," did not include a water-rate. They meant rates in the proper sense of the term, and did not include water-rates.

The MASTER OF THE ROLLS was of the same opinion. He said the question was whether the Corporation were entitled to differentiate the water-rate. Mr. Justice Bigham upheld the contention that they were not entitled to do so; and they had to see whether the Act had imposed a limitation on the right of the Corporation to charge for water supplied other than one as to the maximum charge allowable. That was to say, they had to see whether the Act imposed the obligation of equality of charge. It was said that section 36 of the Northampton Corporation Water-Works Act, 1884, imposed the obligation. In his opinion, however, that was not the true effect of the section. Why should the Court import into it an obligation of equality of charge? The main reason alleged was because the section spoke of a "water-rate;" and the suggested analogy of a poor-rate had been pressed upon them. It seemed to him that the basis upon which the obligation of equality of charge rested in the case of a poor-rate was entirely absent when one came to consider that of a water-rate. In the original enactment by which the poor-rate was established, there was, no doubt, no express provision for equality of rate; but the very reason and essence of the poor-rate involved equality, because it was an imposition upon citizens to contribute to the poor fund according to their means. What possible analogy was there between this and the case of a person purchasing a marketable commodity, such as water? The latter case was altogether different from the obligation of a citizen to fulfil a public duty and to support a public burden. For these reasons, as well as for those given by the Lord Chief Justice, he thought the judgment of the Court below could not be supported.

Lord Justice ROMER expressed similar opinions, and arrived at the same conclusions.

The appeal was therefore allowed.

Friday, Jan. 22.

In re an Arbitration between Gough and the Aspatria, Silloth, and District Water Board.

Two appeals from the decision of Mr. Justice Wright, delivered on Feb. 20, 1902*—one presented by Miss Gough, and the other by the Water Board—were to-day before the Court.

Sir RALPH LITTLER, K.C., and Mr. W. G. CLAY appeared for Miss Gough; Mr. BALFOUR BROWNE, K.C., and Mr. ROSKILL, K.C., represented the Board.

Sir R. LITTLER said his appeal was presented before the Arbitrator in the matter (Mr. R. E. Middleton, M.Inst.C.E.) made his supplemental award, or rather before it was taken up; and the only question now to be disposed of was one of costs. Mr. Middleton had awarded a sum on apparently two different grounds of claim; and the matter was referred back to him to state how much he had allowed in respect of each. When the award was taken up, it appeared that he had only awarded in respect of one matter. Mr. Justice Wright had held that Miss Gough had no right to compensation in respect of water.

The LORD CHIEF JUSTICE said they would hear the arguments on the appeal upon the main point first, and dispose of the question of costs afterwards. As he understood, the first appeal was rendered unnecessary and useless because of the further award; and had it been taken up when it was made, there would have been no necessity for an appeal.

Sir R. LITTLER assented.

Mr. BALFOUR BROWNE said his appeal was on merits. The Arbitrator had awarded the claimant a sum of £8974, which included £4700 for over-water, and £1636 for special adaptability; the over-water lake being on the estate of Miss Gough. The scheme of the Water Board was to raise the water, by means of a small embankment at one end, so as to cover certain land; and for this purpose land had to be taken compulsorily. At the hearing, the Board agreed only to take an easement to cover the land with water, Miss Gough being at liberty to exercise her rights of boating and fishing on the lake. Another part of the scheme was to make a reservoir, and by means of an embankment to impound the water partly on her property and partly on that of others; and two questions arose in the course of the arbitration. Miss Gough claimed the right to utilize the waters of the over-water lake, and said that if the Board had not come, she would have sold the water to some other authorities. The Board denied her right to sell water without an Act of Parliament, and said that in their Act, which authorized them to raise the level of the lake, there was a clause sanctioning compensation to riparian owners, and that this covered the claim in respect of water. The Arbitrator stated a special case upon the point; and Mr. Justice Wright held that although the claimant was not entitled to anything for water, if the Board were covering the over-water lake with a film of water, she was entitled to compensation in respect of this; and the case went back to Mr. Middleton for him to say how much he had included for water and how much for merely depriving Miss Gough of some of the rights she previously had. He replied that he had not allowed anything for water; and, therefore, upon that point, he had nothing more to say except that he thought he had been misled. The other point was a totally different one. Miss Gough claimed that she was entitled to be paid compensation because the land was specially adaptable for reservoir purposes. He (the learned Counsel) disputed the proposition that mere physical adaptability to make a reservoir by the erection of a small dam, without there being a market for the water, was a matter which could be taken into consideration.

The LORD CHIEF JUSTICE: Then you must go to the House of Lords and do that, as the point was decided by Lord Bramwell in *Riddle v. Newcastle and Gateshead Water Company*.

Mr. BALFOUR BROWNE said in the case of the Countess of Ossalinsky and the Manchester Corporation, physical adaptability and possible market were held to be matters that ought to be taken into consideration. Having called attention to the various authorities on the point, the learned Counsel submitted that the appeal of the Board should be allowed.

Mr. ROSKILL followed on the same side, and contended that prospective value must be of such a kind as to be effective and realizable at a date not remote; but in this case there was not a shred of evidence in support of this contention.

The LORD CHIEF JUSTICE said the point that had been argued by Mr. Balfour Browne was undoubtedly of very great importance; but if it was to be laid down, it must be done by the House of Lords. The Arbitrator had found, in the case in which land was to be taken for a reservoir, that the over-water lake, and also the other part of the land, was peculiarly adaptable for the purpose; and he had awarded £1636 beyond the normal market value of the land because of its special adaptability. It was contended by Mr. Balfour Browne that this was not a proper element of consideration—first, on the ground that it was in some way giving a value to the land because of the purpose to which it was going to be put by the statutory purchaser, which was always excluded; and, secondly, because the Arbitrator had not gone on to say that some other purchaser might come along who would pay for the additional value. Both of these points were decided by Riddle's case as being contrary to the principles of compensation. In that case, there was a clause which, in the judgment of the Court of Queen's Bench and the Appeal Court, prevented the claimant from getting compensation for the loss of the water; and, in the present case, Mr. Justice Wright had also found that the owner of the land could not sell the water as water in bulk, and that she had no right to compensation except as a riparian proprietor. The point was not argued in Riddle's case in the Court of Queen's Bench before Justices Mellor and Manisty. But when the case reached the Court of Appeal, it was contended that the Arbitrator (Mr. Clutton) had excluded from consideration the question of the adaptability of the site; and Lord Bramwell clearly thought that the element of adaptability was distinctly a ground for enhanced value in the hands of the vendor. Not a word was said in the judgment that, in addition, the Court also found that there were other purchasers besides the acquiring authority. Therefore the Court of Appeal decided that the element of value in the land itself was a matter for compensation as being part of the property of the owner or vendor. He (his Lordship) was Counsel in that case, and he consulted a well-known authority upon the point—viz., Lord Justice Thesiger—who informed him that the Appeal Court had only followed what had for many years been the recognized practice of experienced surveyors. So deep an impression did the case make on his mind, that he also consulted Mr. Hunt and Mr. Pownall; and they both said that the rule laid down by the Appeal Court was not new, but one on which they had always acted. In the Countess Ossalinsky's case, it was held that a site being suitable for a reservoir was a matter which could not be left out of consideration. He thought Mr. Justice Wright had in no way added to what the Arbitrator had found, but, on the contrary, had decided, in accordance with the same principle, that if there was a site which had peculiar natural advantages for the supply of water to valleys, apart from the value created or enhanced by any

* See "JOURNAL," Vol. LXXXI., p. 487.

Act of Parliament, that point must be taken into consideration. The appeal of the Water Board therefore failed, and must be dismissed with costs. As to the cross-appeal by the claimant, he thought it was unfortunate that the supplemental award had not been taken up, in which case it would have been seen that an appeal was unnecessary, and the notice could have been withdrawn. This course not having been followed, the appeal would also be dismissed, with costs.

The MASTER OF THE ROLLS and Lord Justice ROMER gave judgment to the like effect.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

Tuesday, Jan. 26.

(*Before Mr. Justice* BUCKLEY.)

Attorney-General and Others v. Ashton Gas Company.

This case was argued on the 20th ult. (*ante*, p. 218), when judgment was reserved. It was delivered to-day.

His LORDSHIP said: By sections 16 and 17 of their Special Act of 1877, the defendant Company are precluded from paying dividends in excess of a certain rate fixed by a sliding-scale dependent on the price charged for gas. Their practice has been, and is, to pay dividends at the maximum rate thus fixed, but free of income-tax. The whole question in the case is whether this was a payment in excess of that allowed by the Act. The point is the simplest possible, and but for the fact that some provisions of the Income-Tax Acts have to be considered, and that these Acts are not always easy of construction, I should have thought it incapable of the amount of argument it has received. The obvious solution seems to be that when a company pay (say) 10 per cent. free of income-tax, they give the shareholder 10 per cent. and relieve him from liability to make any payment to the Inland Revenue, or allowance to the company for it. In other words, he receives 10 per cent. and an indemnity against a liability to pay part of it to the Revenue or allow a deduction to the company for such part as they have paid for income-tax. Further, if he be a person of limited income, entitled to remission or abatement of income-tax, he will, in fact, receive 10 per cent. and the income-tax, or so much income-tax as he claims from the Revenue authorities. The argument addressed to me has been that inasmuch as, under the machinery of the Income-Tax Acts, a corporation is assessed under Schedule A and pays income-tax on all its profits, the corporation has nothing out of which it can pay the corporators' dividends beyond the balance which remains after it has paid the income-tax payable, and that out of this fund it is entitled to give the shareholder not exceeding (say) 10 per cent. This argument, I think, rests upon a fallacy. The profits are not arrived at after deducting the income-tax, but the tax is a part of the profits—namely, such part as the Revenue is entitled to take out of them. A sum which is an expense which must be borne whether profits are earned or not must, no doubt, be deducted before arriving at the profits; but a proportionate part of the profits payable to the Revenue is not a deduction before arriving at the profits, but a part of them. (See Lord Blackburn's judgment in *Last v. London Assurance Company*, 10 Ap. Cases, 445.) Under the Income-Tax Acts, all income has to pay the tax, but not to pay it twice over. If it has already been paid under Schedule A, it is not payable again under Schedule D. But this does not prove that the person who receives a distributive share of the fund does not bear income-tax in respect of his ownership of shares in the company. The Act provides that he shall. The relevant machinery is that under section 40 of the Act of 1842. The company are chargeable, and their officer has to do the necessary acts and make the necessary return on their behalf. By section 54, he has to prepare a statement of the profits, and the estimate is to be made of the amount of them before any dividend shall have been paid thereon to the member; and the member is to allow out of such dividend a proportionate deduction in respect of the duty so charged. The words which here command attention are that the member is to "allow the duty out of the dividend." This particular Company is governed by section 60, No. 3, of the Act of 1842. The section goes on to repeat or reproduce, but not very accurately, some part of the matter which had already been dealt with by section 54; and the words as to the allowance of the proportionate deduction of the duty are not identical with those of section 54. For the words in section 54 "all such other persons and corporations or companies," section 60 substitutes the words "all such persons, corporations, companies, and societies;" and for the words "out of such dividends," it substitutes "out of such produce or value." An argument has been based upon this, the object of which is to show that the persons who are to make an allowance under section 60 are not the members of the corporation, but the corporation itself, and are intended to provide that the corporation shall make the allowance to its treasurer. This may be so; but I do not think it is. It is true that the draftsman has used a collection of nouns substantive which reproduce those used in the earlier part of the clause with reference to the corporation whose profits are being considered and not the collection of nouns substantive previously used as describing the members to whom the distributive shares are to be paid. But as matter of construction, I think the person to allow under section 60 is the same person as he who has to allow under section 54—viz., the member. But the question is not, I think, vital; for even if the suggested construction of section 60 be right, the liability of the member to make the allowance would still, as it seems to me, be imposed by section 54. When this Company declared and paid a dividend of 10 per cent., a member would be bound to allow the corporation to deduct income-tax upon his dividend, and he would receive a net sum of less than 10 per cent. When a dividend of 10 per cent. was declared and paid free of income-tax, the member received a sum larger by the amount of the income-tax, which has not then to be deducted. The whole question is: Are the profits thus divided among the shareholders in excess of 10 per cent. on the capital? I think they are. It is exactly as if the Company declared a dividend of 10 per cent. and the amount of the income-tax; so that when statutory deduction of the income-tax is made, the shareholder will have a clear 10 per cent. In my opinion, the plaintiffs are right. They ask for a declaration that, according to the true construction of the Acts of 1847 and 1877, and in particular sections 16 and 17 of the Act of 1877, the profits divisible in any year among the shareholders of the Company ought to be calculated as inclusive, and not exclusive, of the amount payable for that year in respect of income-tax on the profits proposed to be divided. I think the plaintiffs are entitled to such a declaration. I do not know whether an injunction is asked for, or whether this declaration and the costs of the action will be sufficient.

Mr. R. J. PARKER, for the plaintiffs, thought the declaration would be sufficient, with liberty to apply, if necessary, for an injunction.

His LORDSHIP said then he would simply make the declaration, and order the defendants to pay the costs of the action.

COURT OF SESSION—SECOND DIVISION.

Tuesday, Jan. 26.

(*Before the* LORD JUSTICE-CLERK, *Lord* YOUNG, *Lord* TRAYNER, *and Lord* MONCREIFF.)

The New Conveyor Company and their Patent.

Counsel were heard to-day in the reclaiming note for the pursuers against the decision of Lord Low in the Outer House in the action by the New Conveyor Company, Limited, against the Edinburgh and Leith Corporations Gas Commissioners. The Company sued for £2500 as damages, and for interdict against infringement of the letters patent No. 20,709, dated Nov. 16, 1892, for "Improvements in Charging Inclined Retorts." Lord Low refused a motion by the pursuers for a sist, in order that they might apply at the Patent Office for leave to disclaim a portion of their complete specification, as not being in conformity with the provisional specification; and he found the pursuers liable in expenses.*

Mr. A. URE, K.C., and Mr. CRAIGIE, appeared for the pursuers and reclaimers; Mr. T. SHAW, K.C., and Mr. J. DUNCAN MILLAR represented the defenders and respondents.

Mr. CRAIGIE, having explained the purpose of the action, said his motion would be that he should have an opportunity to disclaim part of what was claimed in the complete specification, on such terms as their Lordships might grant. He thought the Lord Ordinary should not have dismissed the action, but he had done so on the ground that, in the whole circumstances, this was the best course. Counsel submitted that it might do harm to the pursuers if the action were dismissed at that stage. It appeared that if a wrong piece of a specification were put in in good faith, the Court might allow damages for infringement even prior to a disclaimer.

Lord MONCREIFF said he supposed the procedure before the Patent Office for the amendment of the specification would occupy a considerable time.

Mr. CRAIGIE said it would take a little time undoubtedly, though he did not know how long. But he submitted that he was entitled to take this course. Section 19 of the Act of 1883 said that, "in an action for infringement of a patent, and in a proceeding for revocation of a patent, the Court or a Judge may at any time order that the patentee shall . . . be at liberty to apply at the Patent Office for leave to amend his specification by way of disclaimer, and may direct that in the meantime the trial or hearing of the action shall be postponed." Under this section it was contemplated that the action need not be dismissed.

Lord TRAYNER: That is to say, it is in the discretion of the Judge before whom the action may come to do that. Here the Lord Ordinary has exercised his discretion, and has refused to postpone the case. Is there any ground for its going any further?

Mr. CRAIGIE submitted that it might be a hardship to the pursuers if the action were not kept in Court. Section 20 of the same Act said that "no damages shall be given in any action in respect of the use of the invention before the disclaimer, correction, or explanation, unless the patentee establishes to the satisfaction of the Court that his original claim was framed in good faith and with reasonable skill and knowledge."

Lord YOUNG: You can do that in another case.

Mr. CRAIGIE thought it rather looked as if it must be in the same action that he must establish that. But, in any event, his case was simply that he wanted to disclaim a very important part of the complete specification, because it was not in accordance with the provisional specification.

Lord TRAYNER pointed out that, if this were allowed, it would only be upon condition of paying all the expenses up to date. Even if they should come back to the Court, it might be that their amendment, if allowed, would vary, alter, or extend the conclusions of the summons. How much cheaper would it be to bring a new action?

Lord YOUNG: The amendment might not be allowed.

Mr. CRAIGIE urged that the pursuers were advised that it would be better that the action should be kept in Court; and he asked their Lordships to recall the interlocutor of the Lord Ordinary, in order to allow application to be made to the Patent Office. Of course, this would be done under such conditions as their Lordships might now determine.

Counsel for the respondents were not called upon.

The LORD JUSTICE-CLERK said he should be inclined to say the Lord Ordinary had taken the proper course; and he certainly should not think it right to interfere with the discretion of the Lord Ordinary in the matter, unless there were very strong grounds for doing so.

The other Judges concurred without remark; and the decision of Lord Low was affirmed.

Mr. MILLAR moved for expenses as between agent and client. The principle he proceeded upon was that where a statutory body were exercising their duty under a statute, as in this case the Commissioners

* See "JOURNAL," Vol. LXXXIII., p. 251.

were doing, and an action was brought against them, they were entitled to expenses, which would amount to a very considerable sum.

Lord TRAYNER said it was quite true that public authorities were entitled, in some cases, to expenses as between agent and client, but this was when they had been challenged for what they had been doing in the exercise of their public functions. The case which had been brought against the Commissioners was that they were liable in damages for infringement of a patent. It was not, *ex facie*, a thing done in the exercise of their statutory power. It was not a question of bad gas supply, or of interference with streets or private property in laying their pipes. Anything of that kind would be within their proper function; but this was an allegation that they had done a patentee a wrong.

Mr. MILLAR submitted that in the manufacture of gas certain processes were necessary; and if a public authority considered it advisable, in the exercise of their duty, to adopt a certain process, they were acting under their authority.

The Court refused the motion, but allowed expenses against the reclaimers in the ordinary way.

Connection of Privately Owned Gas-Meters.

At the Halifax County Court, last Thursday, the Sowerby Bridge District Council sued Mr. J. W. Lodge, an ex-member of that body, for 2s., the cost of connecting a gas-meter to the service-pipes. It was stated that when meters were hired from the Council by gas consumers no charge was made for fixing. In this case, the meter was the property of Mr. Lodge, and the Council considered that they were entitled to charge for fixing it. Defendant denied liability. He said that he could not become a consumer of the Council's gas unless a connection was made with his meter; and he contended that this work should be done free of charge. Judgment was given in his favour, with costs.

Extensive Prepayment Meter Robberies at Watford.

In consequence of several reports having been received that prepayment meters had been broken open, and the money removed therefrom, in unoccupied houses at Watford, the police arrested two youths named Kiff and Humphrey, who subsequently admitted their guilt. When the case came on at the Watford Police Court, Mr. J. W. Godwin, Superintendent of the Gas Company, produced five broken padlocks. He said that when the Company knew a tenant was leaving a house they took the meter away; but in these instances they had not been notified. Each defendant was sentenced to two months' hard labour.

A New Mantle Fluid.

The Swindon Magistrates last week committed for trial on a charge of fraud a man named Frederick Williams. The prisoner, it was stated, had called upon shopkeepers in a large number of towns, and induced them to take up agencies on behalf of a London firm for the sale of a fluid which he described as magnesium carbide—a composition which he had patented for strengthening incandescent mantles and improving the light. Not only did he supply the agents with testimonials, but he promised to send two of the firm's men into the neighbourhood to distribute bills advertising "the wonderful patent," and announcing the appointment of the local agent. It was, however, ascertained that no such firm as stated existed in London; and analysis proved that the "magnesium carbide" consisted of a mixture of whiting and water, and was of no value. Williams, who has been the subject of complaints for about three years, and has over a hundred charges against him, pleaded that he took over the business as a legitimate concern.

Dangers of Acetylene.—Details reached London on Saturday of a fatal acetylene explosion which occurred on Thursday at Rognonas, near Avignon. At about a quarter past nine, when the Café de France was crowded, a loud explosion was heard, and the whole building fell in upon the customers. Gendarmes and soldiers were soon on the scene, and started clearing away the *débris*. Ten lifeless bodies were found, among them those of the proprietor and his wife and daughter. Other persons to the number of seventeen were severely injured, while several customers at a café opposite received cuts from the glass which was blown across the street. There had been complaints of a disagreeable odour of gas pervading the café; and it is reported that the proprietor took a lantern to the generator to ascertain the cause, with the resulting disastrous effect.

Proposed Joint Water Scheme for Glossop and Hyde.—A meeting of the Glossop Town Council took place on Wednesday under the presidency of the Mayor (Mr. E. Partington), to consider a proposed joint scheme between the Glossop and Hyde Corporations to impound the waters of Shelf Brook and Yellow Slack, and to construct at Glossop a reservoir to contain 617,264,000 gallons. The estimated cost was £120,000, and the suggested proportions were: Glossop, two-fifths, £48,000; Hyde, three-fifths, £72,000. The time estimated for carrying out the work is about six years. The scheme was discussed at great length, and it was pointed out that its adoption would mean an increase in the rates of at least 8½d. in the pound. The existing water-works of Glossop cost £36,000, and this would be cleared off in about seven years. If the scheme was not adopted, and any other authority wanted the water, they would have to consider the claims of Glossop. A resolution was proposed authorizing the Water Committee of the Glossop Corporation to proceed with the negotiations with the Hyde Corporation with a view to the details of the proposed scheme being agreed upon, and subsequently submitted to the Council for adoption. Some opposition was offered to the proposal; but it was eventually carried by 11 votes to 8.

MISCELLANEOUS NEWS.

THE GASLIGHT AND COKE COMPANY.

Half-Yearly Report and Accounts.

The following is the report on the working of the Company during the six months ending Dec. 31, which, with the accounts, will be submitted to the proprietors on Friday:—

The accounts for the past half year show that, after providing for the fixed charges, there remains a balance, including the amount brought forward, available for distribution of £510,767 13s., out of which the Directors recommend a dividend on the ordinary stock at the rate of £4 8s. per cent. per annum, which will absorb £335,350 8s.; leaving the sum of £175,417 5s. to the credit of the current half year. The dividend for the corresponding half year, 1902, was at the same rate, and the amount then carried forward was £65,146 19s. 4d.

The quantity of gas sold during the half year was 10,242,436,000 cubic feet, which is less by ¾ per cent. than the quantity sold during the corresponding period of 1902. The additions to the number of consumers are considerable, especially to those on the automatic meter system; the Company having added during the past half year 14,911 new supplies, of which 11,900 are on this system. The number of stoves sold and let on hire has increased by 11,779 during the same period.

The satisfactory financial result of the half-year's working is mainly attributable to a reduction in the cost of coal and to enhanced prices obtained for residuals—coke, breeze, and tar and ammoniacal products all showing an increase in value.

There is not much, so far as the interests of the Company are concerned, which is likely to occupy the attention of Parliament during the ensuing session. The more important Bills affecting the Company are the Gaslight and Coke and other Gas Companies' Acts Amendment Bill, introduced by the London County Council (providing for alterations in the procedure in gas-testing appeals), and the London Port and Docks Bill. As regards the former, it is possible that some arrangement may be come to with the London County Council which would render the opposition of this Company unnecessary. The number of Bills seeking power to construct underground railways and to carry out other work affecting the Company's mains appears to be somewhat less than usual; and the Directors hope that no great expense will be incurred in obtaining the insertion of the necessary protective clauses.

The Directors have reason to believe that a Departmental Committee of the Board of Trade to inquire into the Regulations for Testing Gas in the Metropolis will very shortly be appointed.*

The Directors have to announce with much regret the resignation, in September last, of Mr. John Birch Paddon, who, as a Director possessing the experience of an eminent Gas Engineer, has rendered most valuable services to the Company during the past twelve years. The seat at the Court thus rendered vacant was filled by the appointment, for the remainder of Mr. Paddon's term of office, of Mr. John William Field, the late Secretary and General Manager, whose intimate acquaintance with the affairs of the Company and long experience as principal officer render him, in the opinion of the Court, exceptionally qualified for the post of Director.

The Court of Directors has been furnished by the several Engineers of the Manufacturing and Distribution Departments respectively with the usual certificates that all the Company's plant has been maintained in thorough efficiency.

The accounts accompanying the report consist of the usual statements, from which we take the following particulars:—

The statement of capital (stock) sets forth that the total paid up is £9,466,500; added on conversion, £12,176,565—total amount authorized, £21,643,065. The statement of loan capital stands thus: Total paid up, £2,844,000; added on conversion, £1,479,975; unissued, £750,000—total amount authorized, £5,073,975.

The capital account shows receipts (with premiums, £1,586,807) to the amount of £27,553,847 11s. 9d. The expenditure is shown in the following items:—

Expenditure to June 30, 1903			£13,052,387 10 2
Expenditure during the half year to Dec. 31, 1903—viz.,			
New and additional mains and service-pipes	£27,392 17 5		
Do. do. meters	35,722 0 7		
Do. do. stoves	32,020 8 3		
	£95,135 6 3		
Sale of surplus land	£68 6 0		
Depreciation of plant	7,931 19 4		
	8000 5 4		87,135 0 11
Total expenditure			£13,139,522 11 1
Nominal amount added on conversion			13,656,540 0 0
Balance of capital account			757,785 0 8
			£27,553,847 11 9

The balance available for division is £510,767 13s.; and the statement showing how it is proposed to appropriate it is as follows:—

Dec., 1902.		
£68,165 ..	Net balance brought from last account	£116,530 3 6
332,332 ..	Net revenue for the half year	394,237 9 6
£400,497		£510,767 13 0
(£4 8s. per cent.)	A dividend on the ordinary stock—	
£335,350 . .	£4 8s. per cent. per annum on £15,243,200	335,350 8 0
£65,147 ..	Balance carried to next account	£175,417 5 0

The three statements relating to the reserve, insurance, and depreciation funds show that the balances on Dec. 31 were as follows: Reserve

* This, as stated elsewhere, has now been done.—ED. J.G.L.

fund, £57,261 19s. 5d.; insurance fund, £92,063 19s. 11d.; and depreciation fund, £55,039. The insurance fund had to bear in the past half year a sum of £63 3s. 8d., the value of plant destroyed by fires in the Company's district.

The following is the revenue account :—

Expenditure.

Dec. Half Year, 1902.		£ s. d.	£ s. d.
	Manufacture—		
£661,934	Coal and oil into store	624,383 16 5	
15,902	Salaries of Engineers and other officers at works	15,709 10 5	
124,761	Wages, gas making £126,217 8s. 0d.	143,607 16 3	
17,571	" sundries £17,390 8s. 3d.		
48,228	Purification, including £19,621 18s. 2d. for labour	57,113 15 8	
184,482	Repair and maintenance of works and plant, materials and labour, less received for old materials, £4073 6s. 6d.	179,240 4 0	
	Distribution—		1,013,057 2 9
34,437	Salaries and wages of officers (including Rental Clerks)	37,078 6 2	
41,902	Repair and maintenance of mains and service-pipes	54,975 6 4	
26,15'	Repair and renewal of meters	26,212 17 0	
28,286	Repair and renewal of stoves	31,648 9 0	
			149,894 18 6
16,625	Public lamps—Lighting and repairing	..	17,811 16 5
	Rents, rates, and taxes—		
6,022	Rents payable	5,921 19 1	
137,660	Rates and taxes	136,401 13 0	
			142,323 12 1
	Management—		
2,750	Directors' allowance	2,750 0 0	
213	Company's Auditors and Assistant	214 14 0	
11,609	Salaries of General Manager, Secretary, Accountant, and Clerks	11,474 1 10	
21,484	Collectors' commission	19,905 19 2	
7,653	Stationery and printing	8,634 15 8	
3,038	General charges	3,112 13 10	
			46,092 4 6
207	Parliamentary charges	..	2,328 19 9
1,526	Law charges	..	840 17 5
4,813	Bad debts	..	4,199 12 4
	Depreciation fund for Works on Leasehold Lands	..	500 0 0
500	Annuities	..	17,421 11 3
15,777	Workmen's compensation account	..	719 13 7
1,593	Balance of stamp duty on increase of nominal capital under the Company's Act, 1898	..	5,049 2 5
5,000	Public officers—		
	Gas Referees and Official Auditor	876 5 5	
782	Public testing-stations	690 2 7	
720			1,546 8 0
£1,421,632			1,401,785 19 0
525,618	Balance carried to net revenue account		586,877 14 0
£1,947,250			1,988,663 13 0

Receipts.

Dec. Half Year, 1902.		£ s. d.	£ s. d.
	Sale of gas—		
	Per meter, at 3s. and 2s. 5d. per 1000		
£1,458,002	cubic feet	1,446,880 14 1	
76,542	Public lighting and under contracts	75,600 6 1	
			1,522,481 0 2
£1,534,544			
28,283	Rental of stoves	..	30,511 16 11
	Residual products—		
£247,006	Coke, less £35,787 18s. 4d. for labour, &c.	274,569 12 8	
12,403	Breeze, less £3082 10s. 11d. for ditto	13,095 15 7	
52,014	Tar and tar products	69,283 4 2	
68,224	Ammoniacal liquor and sulphate of ammonia	74,150 9 10	
			431,099 2 3
£379,647			
£4,517	Rents receivable		4,307 18 8
259	Transfer fees		263 15 0
£1,947,250			1,988,663 13 0

The following statements relate to the working :—

Statement of Coal Used, &c.

Description of Coal.	In Store June 30, 1903.	Received During Half Year.	Carbonized During Half Year.	Used During Half Year.	In Store Dec. 31, 1903.
	Tons.	Tons.	Tons.	Tons.	Tons.
Common	165,669	968,793	845,144	16,702	272,616
Cannel	13,373	3,387	*2,448	20	14,292
Total	179,042	972,180	847,592	16,722	286,908

* In addition to this quantity of cannel, 6,917,416 gallons of oil and spirit were used during the half year.

Statement of Residual Products.

Description.	In Store June 30, 1903.	Made During Half Year.	Used During Half Year.	Sold During Half Year.	In Store Dec. 31, 1903.
Coke—tons	6,294	528,551	122,590	388,320	23,935
Breeze—tons	577	65,535	15,237	49,627	1,248
Tar—gallons	692,890	8,693,945	8,665,142	19,049	702,644
Ammoniacal liquor—butts	10,870	247,302	240,624	..	17,548

Statement of Gas Made, Sold, &c.

Quantity Made.	Quantity Sold.		Total Quantity Accounted for.	Number of Public Lamps.
	Public Lights and Under Contracts. (Estimated.)	Private Lights (per Meter).		
Thousands.	Thousands.	Thousands.	Thousands.	
*10,859,853	486,774	9,755,662	10,387,055	48,721
† 10,923,240	503,841	9,815,631	10,469,343	48,876

* Including 2,257,524,000 cubic feet of "oil gas." † December half year, 1902.

The remaining statement is the balance-sheet, which gives the value of the stores in hand at the close of the half year as follows: Coal, £190,547; oil and petroleum spirit, £60,997; coke, £16,293; tar and ammoniacal liquor and products, £111,377; and sundries, £233,516. The figures this time last year were: Coal, £214,775; oil and petroleum spirit, £35,733; coke, £3954; tar and ammoniacal liquor and products, £83,480; and sundries, £229,685.

THE MARYLEBONE ELECTRIC LIGHTING MUDDLE.

The Marylebone Borough Council held an Adjourned Meeting on Monday last week—the MAYOR (Rev. H. Russell Wakefield) presiding—to further discuss the electric lighting question.

The MAYOR opened the proceedings by stating that, as requested at the last meeting of the Council, he had seen the Metropolitan Electric Supply Company with a view to a postponement, till after the poll, of the payment of the £60,000 ordered by Mr. Justice Buckley to be paid by the 31st of January. The Company had been advised by their Counsel that the matter was one the Court had to deal with, and for anybody on either side to interfere with the Court was something beyond their power. The opinion of their own Counsel was that there would be no contempt of Court by the money not being paid by the date named. The Court would not move till the Company did so; and he had been told by them practically that they would not interfere.

After some discussion, a Committee (consisting of the Mayor, Mr. Elgood, Mr. E. R Debenham, and Mr. Sieveking) was appointed to wait upon the Company, and report the result at the next meeting of the Council.

The debate on Mr. Debenham's resolution, moved at the previous meeting, was next proceeded with in the following altered form: "That the Electric Supply Committee be empowered to prepare for submission to the Council an agreement on the principles of the letter of the General Electric Company of Jan. 19, 1904; and that such legal assistance as is necessary be employed."

Mr. WHITE submitted the following amendment: "That the Electric Supply Committee be empowered to enter into negotiations with the General Electric Company, or any other firm of sufficient stability, as to the future management of the electric supply of the borough, and to report the result to the Council."

The amendment was lost; and Mr. Debenham's resolution was put and carried, with six dissentients.

It was decided that the subject should be further discussed at a special meeting of the Council on the following Monday (yesterday).

Another Special Meeting of the Council was held on Thursday, under the presidency of the MAYOR, when the subject was again discussed at some length.

The MAYOR said the proposition before the Council was the Finance Committee's recommendation as follows: "That the sum of £60,000 be paid to the Metropolitan Electric Supply Company, Limited, being the amount to be paid in pursuance of the order of the Court; and that the sum of £25 15s. 10d. be paid to Messrs. Barlow and Barlow, interest on the amount of their costs from May 21 to June 12, 1903."

A question arose as to the personal responsibility of the councillors who signed the cheque; but it was stated, on the authority of Counsel, that no surcharge could affect them.

Mr. DUNN moved an amendment that the payment of the amount should be deferred until after the poll of the ratepayers, which is to be taken next Monday.

No seconder being found for the amendment, it dropped, and the Finance Committee's recommendation was adopted, on a division, by 28 votes to 15.

Leakage of Gas into Transformer Boxes.—Owing to the detection of an odour of gas in the cellar of premises in Exeter on New Year's Day, attempts were made by the Gas Company's men to locate the leak; but, being unable to do so, on the following Monday, at midday, they filled in the ground and went away. At 1.25 p.m. an explosion occurred in a street-box at the corner of Southernhay, near the premises in question, damaging the transformer apparatus, pavement, railings, &c., to the amount of £22 7s. The Electrical Engineer reported the matter at the meeting of the City Council on Wednesday, when he stated that no notice had been given to him of what was going on, and added that the whole of the supply had to be shut off for two or three minutes, which for a time deprived three local sections of light. It was decided to make a claim against the Gas Company for the amount of the damage, and to ask them to give instructions against attempting to locate a leakage of gas by firing the ground, as had been done in this case, as the practice was attended with great danger.

SOUTH METROPOLITAN GAS COMPANY.

Half-Yearly Report and Accounts.

The following is the report of the Directors of this Company for the six months ended Dec. 31.

The accounts herewith presented for the last half year are considered by the Directors sufficiently satisfactory to justify a reduction of 2d. —*i.e.*, to 2s. 1d.—per 1000 cubic feet from Christmas last. Twopence per 1000 feet amounts (on the quantity of gas sold in the year) to £96,000, which is the measure of the benefit to the consumers of the Company's gas. This considerably exceeds the surplus profits of the past year; but with £55,400 to carry forward, the Directors felt that they might again act in accordance with the fixed policy of the Company, and make the largest reduction possible.

Compared with a generation ago, there has been a complete revolution in the position of gas companies and in the use of gas. Prior to 1870, the supply of gas was, in a double sense, a monopoly; for since the fifties there had been no competition between the companies (each having a separate district) and there was no competing artificial light. Vegetable oil at 5s. and sperm oil at 7s. a gallon were out of the question for ordinary use; and nothing remained but candles. Moreover, at that time gas was almost exclusively used for lighting with luminous flames only; and the amount of light obtainable, from 5 cubic feet of gas per hour with the best burners, was only equal to from 12 to 14 candles. At that time, Parliament thought it necessary, for the protection of the public (who, having no alternative, could not then protect themselves), to impose a number of restrictions, which, whatever use they may have been, have certainly kept up the price of gas. Now everything is changed. Instead of being a simple lighting agent by luminous flames (probably 99 per cent. being then thus used), a moderate estimate shows that at least 50 per cent. of the gas sold today is used for other purposes than lighting. In the gas-engine, it is the most economical and convenient source of power. It is extremely popular for cooking. Some 200,000 in all, or about 70 per cent., of the Company's ordinary customers, and over 80 per cent. of the slot-meter consumers, have cooking-stoves; the remainder of the latter who have no convenience for a stove having a contrivance for boiling, frying, &c., by gas. Then there are gas-fires by tens of thousands; while for manufacturing purposes innumerable contrivances have been introduced for using gas, greatly enlarging the demand. For all these purposes, neither a luminous flame nor refinements of purity are necessary. In fact, in nearly all, the actual luminosity is destroyed by an admixture of air before burning in what is known as the bunsen burner. A low price is the one essential qualification.

There remains the use of gas as a lighting agent; and in this particular the change is not less radical. In the first place, the consumer is in a position of complete independence. If for any reason gas does not suit him, he uses mineral oil or electricity—both being practical alternatives. Then the light-giving power of the gas burnt as a luminous flame has become of little or no importance, by the introduction of the incandescent mantle, which enables 5 cubic feet of gas, converted into a non-luminous flame by the bunsen burner, to produce a light equal to about 100 candles against the 12 or 14 candles of thirty or forty years ago. By the cheapening of the mantle within the last two years (for which this Company may take some credit), an enormous development has been effected in its general use. In fact, this country is fast approaching the condition of Germany, where it was said in 1900 that about 90 per cent. of the gas used for lighting was with the incandescent burner—they having had several years' start in the matter of cheap mantles. From a given quantity of gas, the consumer has now the power to get at least six times the quantity of light. But, this being much more than he wants, he generally increases his light about threefold and reduces his consumption of gas by about one-half. That being so, the sooner he discards the luminous flame from his shops and offices and working and living rooms, the better; leaving the old-fashioned burner with its luminous flame for out-of-the-way places, where a small light will answer the purpose. To facilitate the use of mantles, the Company undertake their maintenance at cost price.

The deduction to be drawn is, that all needless restrictions on the manufacture and use of gas should be removed, and that the utmost freedom, consistently with the public interest, should be given to the manufacturers, that they may do their best for the consumers, who are their partners under the sliding-scale, which, with the auction clauses, has identified the interests of consumers and shareholders since the seventies. A supply of gas at something below 2s. per 1000 cubic feet is a great *desideratum* for our towns and cities.

Gaseous fuel is the cure for the smoke nuisance. Gas has done much in that direction by the cooking-stove, &c.; and now that a non-luminous gas suffices for lighting and all other purposes, Parliament should give facilities for the introduction of cheap fuel gas. The existing gas companies are the parties to supply it.

The only change of importance that has taken place recently in the business of the Company has been the purchase of the tar-works at Ordnance Wharf, East Greenwich, where, since June last, the Company has dealt with the whole of its tar. The financial result, so far, has been satisfactory, and has given a good return on the outlay of £80,000 of capital, as shown in the accounts.

The Directors consider it a simple act of justice towards the great majority of their employees to state that the satisfactory position of the Company is largely due to their loyal co-operation. The profit-sharing system, started in 1889, has now developed into the wider and better one of co-partnership, under which title it will henceforth be known.

The dividend to be recommended is at the same rate per annum as for the previous three half years—viz., £5 6s. 8d. per cent.; being the full dividend to which the shareholders are entitled under the sliding-scale.

The principal portions of the accounts are as follows:—

The first two statements relate, as usual, to the stock and loan capital. The former sets forth that the standard rate of 4 per cent. is payable on £6,011,224 and £138,776 (Act of 1901) of stock; while the latter shows that the loan capital, the rate of interest on which is 3 per cent., amounts to £1,798,994 and £33,706 (Act of 1901). The third statement is the capital account. It stands as follows: Amount received, £4,919,894; nominal amount added by conversion (less premium), £3,062,806—total, £7,982,700. The items of expenditure are as follows:—

Capital account to June 30, 1903		£4,490,535 1
Expenditure during half year to Dec. 31, 1903, viz.—		
New buildings and machinery in extension of works	£13,514 9 11	
Purchase of tar-works	80,000 0 0	
Purchase of new land and incidentals	12,950 0 0	
New and additional mains and services	14,077 2 0	
New and additional meters	17,229 2 5	
New and additional stoves	9,895 19 6	
		147,696 13 10
Total expenditure		£4,638,232 3 8
Balance		281,661 16 4
		£4,919,894 0 0
Nominal amount added by conversion, less premium		3,062,806 0 0
Total		£7,982,700 0 0

The following is the revenue account:—

Expenditure.

Manufacture of gas—		
Coal into store, including £27,881 6s. 6d. for labour.	£335,931 14 3	
Purification, including £7584 0s. 4d. for labour	20,977 19 0	
Salaries of Engineer and Officers at works	11,780 11 1	
Wages (carbonizing)	59,771 7 10	
Repairs and maintenance of works and plant, including £57,852 16s. 11d. for labour, less £4719 3s. 2d. received for old materials	113,188 19 0	
		£541,650 11 2
Co-partnership		16,000 0 0
Distribution of gas—		
Repair, maintenance, and renewal of mains and service-pipes, including £22,876 1s. 7d. for labour	£35,515 2 9	
Salaries and wages of officers, including Rental Clerks	14,745 16 1	
Repairing and renewals of meters, including £5070 18s. for labour	24,018 2 5	
Repairing and renewals of stoves, including £10,895 14s. 1d. for labour	22,517 19 2	
Gas-fittings (labour)	9,693 5 5	
		106,490 5 10
Public lamps—		
Lighting and repairing, including £12,163 7s. 11d for labour		16,672 1 2
Rents, rates, and taxes—		
Rents payable	£1,280 0 6	
Rates and taxes	38,035 18 4	
		39,315 18 10
Management—		
Directors' allowance	£2,536 2 0	
Salaries of Secretary, Accountant, and Clerks	2,852 12 3	
Collectors { Ordinary	5,073 5 4	
Collectors { Slot meter	5,801 4 5	
Stationery and printing	2,763 19 1	
General charges	7,641 12 1	
Company's Auditors	112 10 0	
		26,781 5 2
Law charges	£2,548 17 1	
Parliamentary charges	614 13 1	
		3,163 10 2
Bad debts		1,834 9 7
Pensions and officers' and workmen's superannuation, sick, and accident funds		5,762 7 10
Gas Referees and Official Auditor		243 6 4
Total expenditure		£757,913 16 1
Balance carried to net revenue account		222,554 18 4
		£980,468 14 5

Receipts.

Sale of gas—		
Michaelmas, at 2s. 3d. per 1000 feet	£245,459 17 8	
Christmas, at 2s. 3d. per 1000 feet	378,476 14 3	
	£623,936 11 11	
Public lighting, including labour, repairing, and materials	29,175 9 5	£653,112 1 4
Meters in use (267,204)—		
Company's meters at rent: Ordinary, 102,252; slot, 155,829	£28,542 7 6	
Company's stoves at rent: Ordinary, 62,846; slot, 131,248; fires, 17,121	22,786 1 5	
		51,328 8 11
Residual products—		
Coke, less £1812 16s. 10d. for cartage; £14,687 0s. 5d. for labour, &c.	£177,212 17 2	
Breeze, less £638 2s. 8d. for cartage; £1503 18s. 10d. for labour, &c.	7,817 3 10	
Tar and tar products	33,758 2 2	
Sulphate of ammonia	55,682 2 11	
		274,470 6 1
Rents receivable		1,479 8 1
Transfer fees		78 10 0
Total receipts		£980,468 14 5

The net revenue account shows a sum of £190,445 applicable to dividend on the ordinary stock. Following this are the statements relating to the reserve, renewal, and insurance funds. They show that the balances on the 31st of December last were as follows: Reserve fund, £155,188; renewal fund, £21,402; insurance fund, £91,156.

The statements furnishing manufacturing details are as follows:—

Statement of Coal.

In Store June 30, 1903.	Received During Half Year.	Carbonized During Half Year.	Used During Half Year.	In Store Dec. 31, 1903.
Tons.	Tons.	Tons.	Tons.	Tons.
52,347	660,689	579,410	917	132,709

Statement of Residual Products.

Description.	In Store June 30, 1903.	Made During Half Year.	Used During Half Year.	Sold During Half Year.	In Store Dec. 31, 1903.
Coke—cwts.	114,118	7,144,555	1,899,865	5,122,922	235,886
Breeze—yards	2,730	137,389	47,435	84,811	7,873
Tar—gallons.	289,398	5,732,216	26,770	5,601,765	393,079
Ammoniacal liquor—butts	32,825	176,697	194,357	..	15,165

Statement of Gas Made, Sold, &c.

Quantity Made.	Quantity Sold.		Total Quantity Accounted for.	Number of Public Lamps.
	Public Lights (estimated).	Private Lights (per Meter).		
Thousands. 6,221,907	Thousands. 181,934	Thousands. 5,614,083	Thousands. 5,882,601	19,776 incand't 2,459 flatflame

The remaining statement is the balance-sheet, which gives the value of the stores in hand at the close of the half year as follows: Coal, £76,820; coke and breeze, £8732; tar, sulphate, and ammoniacal liquor, £39,467; and sundries, £234,565. The figures this time last year were: Coal, &c., £81,602; coke and breeze, £5506; tar, sulphate, and ammoniacal liquor, £19,931; and sundries, £221,911. A sum of £37,246, workmen's bonuses and savings, has been deposited with the Company; and the total of the officers' superannuation and guarantee funds is £18,711. The figures this time last year were £22,288 and £15,565.

EDINBURGH AND LEITH GAS COMMISSIONERS AND THEIR WORKMEN.

Memoranda by Mr. Herring on the Subject.

In the "JOURNAL" for the 19th ult., a report appeared in our Scotch Notes of a meeting of workmen relative to the conditions of labour in the new Granton Gas-Works. The Works Committee had, at a meeting on Monday, the 11th ult., remitted to the Granton Works Sub-Committee to deal with the petition of the workmen, which was dated Dec. 4; and at a meeting of the Commissioners on the 25th ult., it was agreed that the Committee should meet a deputation of the workmen in the works on Wednesday, the 27th ult. In view of their consideration of the subject, Mr. W. R. Herring, the Engineer, prepared, and issued on Saturday, the 23rd ult., the following "Memoranda Relative to the Conditions of Employment, and Notes as to the Manner in which the Workmen's Petition has been handled from the date of its presentation."

The gas workers are recruited from the labouring classes, and are employed with us as such for periods ranging from six weeks to three and five months during the winter season. These conditions affect about 75 per cent. of the men; the remainder working all the year round. After the expiration of their employment as gas workers, they work as labourers, either with ourselves, should we require them, or with others about town. As labourers their pay is 5½d. per hour, or 23s. 4½d. per week of fifty-one hours. As gas workers, they are paid at 8d. per hour, or 5s. 4d. per day of eight hours, which is equal to 37s. 4d. per week of fifty-six hours.

In addition to the above, the men are conveyed by special train from town to the gas-works station and back, free of all cost to themselves. They are provided with commodious mess-rooms, bath-rooms with hot and cold water, plunge baths and shower baths, lavatories, &c., adjoining the buildings in which they work. Further, gas workers who have been employed ten months or more continuously are allowed nine consecutive days' holidays, with pay, during the summer months; and the irregular workmen under ten months' service are granted one day's holiday, with pay, for every two months they have been in the employment. Besides these advantageous conditions, special provision was made in a pension scheme, whereby the gas workers, although in the employment of the Commissioners only a portion in each year, should be qualified to share in the benefits of such scheme, provided they have a record of twenty years' consecutive service, although only working a few months in each year. The men do not in any way contribute to this fund. In the event of their meeting with an accident while in the service of the Commissioners, they receive half wages from that date until sufficiently recovered for their employment.

As labourers, they work the whole of the nine hours per day, or fifty-one hours per week; but when engaged as gas workers, their duration of labour, although covering a period of eight hours per day, is less than this amount, and varies in proportion to the abilities and smartness of the men themselves—a specific amount of work being allotted for the day's pay. The work performed, although of a physically light order as compared with former methods, exposes the men to a considerable degree of heat, which cannot be avoided in such employment. It is for this reason that unskilled labour is paid at a higher rate than many skilled trades.

When first commencing operations at the new works at Granton, the work was entirely strange both to the old gas workers and the new men who were introduced into the work. As a consequence, the measure of work set them was considerably less than would be fair after the men had become accustomed to the newer methods. Even at the present time we have note of a large number of men who will not again be re-employed as gas workers in consequence of inefficiency. It is not, however, convenient to be constantly changing men during the winter months. At the commencement of the present season, the measure of work which was considered fair was put upon the men; and it is to this they are objecting. They wish to be put back to last year's conditions, when every one of them started as a novice.

The cash value of the men's demands for Sunday work and reduction of labour is equivalent to a rise of 26·78 per cent. in wages, which represents £3271 10s. per annum. The gas workers' wages all round were increased in August, 1899, by ½d. per hour, or a rise equal to 7·1 per cent., or a cash value of £1619 9s. When gas-making operations were commenced at Granton, there were the following classes of men employed in the old works—machine men and stokers at 8d. per hour, potmen at 7½d. per hour, and barrowmen at 6½d. per hour.

In organizing the staff at the new works, I felt that it would be more convenient to have only one class of operatives, all of which would be paid at the rate of 8d. per hour, or 5s. 4d. per shift. This was equivalent to an advance in the wages of potmen of 6 6 per cent., and of barrowmen of 23·1 per cent.; the intention at the time being to make each man competent to handle any part of the apparatus. But I regret to say that my anticipations in this respect have not been realized; a number of the men being anything but willing or able to accommodate themselves to the changed conditions.

I received the workmen's petition on Tuesday, the 3rd of November last, and immediately posted a notice in the mess-room that I would receive a deputation of the men on Friday, the 6th of November. I accordingly met the men and discussed the following particulars: (1) A recognized day's work. (2) The ventilating of charging stage. (3) Sunday labour question. (4) Heat shields. (5) Carbon on retorts. (6) Steam pipes to producers. I called a meeting of the retort-house foremen, to consider points raised at my meeting with the men, on the 12th of November, when we discussed: (1) The pay for Sunday labour. (2) Arrangements for taking a ballot regarding Sunday labour. (3) Physical labour on each shift. (4) The class of men employed. (5) The grievances with regard to the heat.

A notice was posted up on Nov. 16, 1903, intimating that a ballot on the Sunday labour question would take place at the station office on Tuesday, Nov. 17. This ballot was taken, with the result that 113 men voted for Sunday stoppage with loss of pay, and 11 for the present system. On Nov. 21, a further communication was received from the retort-house men asking for another interview, in order to come to a final settlement as regards a recognized day's work. In reply, a notice was posted up arranging to meet a deputation on Nov. 25; and at this meeting the subject was fully discussed. A compromise was offered, and ultimately accepted by the men, to reduce the number of retorts to seventy-five, until the matter could be brought before the Commissioners and settled authoritatively by them. I intimated to the workmen at this meeting that the serious illness of Mr. Purves prevented me discussing this matter with him. The first opportunity at which it was possible for me to lay the facts before the Commissioners was the Works Committee meeting which was to be held on Dec. 14. This meeting was unfortunately postponed, in consequence of the death of Mr. Purves, the late Convener of the Works Committee.

On Dec. 4, notwithstanding the fact that I had fully explained the circumstances to the men as to the cause of the delay in my presenting their case to the Commissioners, they presented a similar petition to Mr. Jack, the Clerk, requesting that it should be brought before the Commissioners. This was formally done at their meeting on Dec. 29 last, when it was remitted to the Works Committee. The Works Committee, at their first meeting on Jan. 11 (when I had the opportunity of reporting the circumstances), remitted the petition to the Granton Works Sub-Committee for consideration and report; and it was arranged that this Committee should consider the matter prior to the Commissioners' meeting on the 25th inst.

The question as to whether the men are being over-worked is best ascertained by reference to the actual time occupied in the discharge of the work allotted to them. As already stated, although the men work eight-hour shifts, they are not working the whole eight hours. A certain measure of work is allotted to them, which some succeed in doing in less time than others—any spare time they may have in this way is at their own service. I have taken care to keep due records from time to time as to the actual duration of physical labour, or the time occupied in doing the work on the eight-hour shift.

On Jan. 21, 1903, when the men were working seventy retorts, the actual time at work ranged from 4 hours 25 minutes to 5 hours 14 minutes; and again on Feb. 11, 1903, from 4 hours 47 minutes to 4 hours 54 minutes. Taking the period when the works were re-started last autumn, and when the amount of work set was eighty retorts instead of seventy, I have a record which was taken consistently from October 9 to 31; and the time ranges from 4 hours 58 minutes to 5 hours 12 minutes. Again, on Nov. 10 and 11, the time occupied was 5 hours 35 minutes and 5 hours 26 minutes respectively. Taking the last round, just before the men leave off work, the time was 4 hours 45 minutes After the temporary compromise offered by me on Nov. 25, which was accepted by the men—namely, to work seventy-five retorts—the time was taken again, on the 6th, 7th, and 8th of January, by three different foremen; the average time being 4 hours 16 minutes. I have been most careful to ascertain whether these records have been fairly kept; and one and all of the men who were trusted with this work are prepared to come before the Committee and swear to their accuracy.

There is no doubt in my own mind that the men imagine they have a grievance in consequence of the introduction of machinery doing away with hand labour. We are now doing with 180 men what it took 570 men at the old works to do; and some of the men seem to think they have a right to impede the work in order that more men may be employed upon it. As a matter of fact, I have reason to be dissatisfied with a very large number of men who are at present employed on these works, and only in November last I was obliged to instruct the foremen to keep a careful note of the negligent and indifferent men, in order that their services might be dispensed with as soon as a reduction of work took place—naturally, with the lengthening daylight—and only the best men retained in the Commissioners' service throughout the year. The physical labour now, as compared with formerly, is very considerably less. If it were not for the heat, which is inseparable from work of this character, boys would be quite capable of doing what is now done by strong men.

With regard to the Sunday labour question, in order to ascertain the

unbiassed opinion of all the men, I determined that a ballot should be taken; the queries put to the men being as to whether they were in favour of Sunday stops without pay, or Sunday work with ordinary pay, as at present. They have almost unanimously voted for Sunday stops; and I see no reason why we should not, during six or seven months in the year, establish this as a matter of practice. If, however, Sunday work must be indulged in from time to time, it is only reasonable to ask the men to work when it is necessary. The terms of employment distinctly provide for seven shifts per week. The men engaged on the eight-hour shifts rotate week by week. Men working on the morning shift one week take the afternoon shift the next, and the night shift the week after. Every third week each man is off duty from 10 p.m. on Saturday night to 10 p.m. on Sunday night; the next week he is off from 6 a.m. on Sunday to 6 a.m. on Monday; and the following week works on Sunday the long shift—namely, from 6 a.m. to 10 p.m.

I may remark that when they work the double shift they are paid the double pay for it. There is no doubt the double shift is a long period, and tries the constitution of the men. On the other hand, however, it clearly proves that the eight-hour shift cannot be such terribly hard work, or they could not work a sixteen-hour shift in succession. We have, however, for some time past been giving the men extra help on the Sunday shift. The arduous character of the double shift on Sunday could be lightened by our dividing Sunday work into two twelve-hour shifts, so that two gangs would work one-and-a-half shifts, instead of one gang doing the double shift.

I have ascertained from the Railway Company that they could conveniently run a train in the afternoon at 5.30 on Sunday, instead of 9.30 at night. This might be offered the men for their acceptance or rejection. I have no doubt in my own mind that, if the men would put their hearts into their work, and take the trouble to become properly acquainted with the apparatus with which they work, they could easily accomplish the task set them—namely, eighty-four retorts on the charging stage, forty-two retorts per man on the drawing stage, and an average of four-and-two-thirds producers on the furnace floor, comfortably (even when adverse conditions prevail at the works) within six hours of labour, which is allowing considerably more than our time records show to be at present required.

In conclusion, I cannot believe that the men will be so senseless as to strike and throw up the advantageous positions they now occupy in comparison with other men of their own class. Should they do so, however, I can assure you that any able-bodied man can be trained to become efficient in the course of from one to two days; and we already have lists with the names and addresses of a large number of men, both inside and outside the works, who are willing and anxious to take their place. I have no fear that should they strike we can easily maintain the supply of gas to the town, without inconvenience or interruption to the public.

METROPOLITAN WATER ARBITRATION.

(*Before the Right Hon. Sir* EDWARD FRY, *Sir* HUGH OWEN, G.C.B., *and Sir* JOHN WOLFE-BARRY, K.C.B.)

Fortieth Day—Monday, Jan. 25.

Close of the Lambeth Company's Case—Opening of the Southwark and Vauxhall Company's Case.

Mr. CRIPPS continued his address on behalf of the Lambeth Company this morning. He dealt with the legal aspect of the question and the definition of the word "stream," which was held to mean running water. If the Company were in the wrong at all, it was because they had taken, in contravention of the agreement of 1886, more than 24½ million gallons of water from the Thames. It came to this, Was there any evidence—if this was the tribunal to try the issue (which he submitted it was not) under compensation matters—how far it had been proved as a matter of fact that they had taken water from the Thames? This would be the issue. Counsel was proceeding to call attention to the evidence when

Sir J. WOLFE-BARRY said: We have had no facts in this matter at all to help us in regard to the levels, the examination of the soil, or the gaugings, or any facts of any sort; and therefore we have to act upon pure conjecture. I mean by conjecture, dealing in the best way we can with the evidence the witnesses on both sides gave us. The only fact we have at present is the analysis of the water dealt with by Professor Dewar.

Mr. CRIPPS, proceeding, said he thought when he had discussed the tables it would be clear there had been no substantial criticism.

The PRESIDENT: I think there is the question of how you would have used the reservoirs.

Mr. CRIPPS said the new reservoirs at Molesey, which had a large capacity, were not yet in use. The Company had given excellent water—there was no question about the sufficient quantity and the excellent purity. At the present moment, they had a stand-by storage, according to the way they had calculated their case, of about 350 million gallons, which had never yet been necessary for the purpose of giving an efficient and pure supply. They were now supplying 32 million gallons daily—they were giving four times the reservoir capacity. The only argument his learned friend (Mr. Moulton) had against this was the extraordinary doctrine that the Company were in a certain sense to be found failing as regards capacity, because they had powers and had not yet begun to put them in force. Both as regards quantity and quality, the water of the Lambeth Company was one of the best in London; and it could not be said that they had not allowed sufficient both as to the present and the future. With regard to the tables, Counsel contended that they showed a large margin of security. In dealing with the financial aspect of the case, all he had to prove was that the income of the Company was maintainable. They were not claiming for an enhanced income as the other side seemed to suggest. He admitted that the Company had come to the end of their resources, except so far as sterilized capital was concerned; and for this reason he had confined his observations to the year 1903. Tables had only been put in to show the position of the Company in the future if they had been let alone. He did not propose to deal with the suggestions contained in the tables of Mr. Haward. It was a fact that all their filter-beds were made out of sterilized capital. How were they to deal with this portion of the expenditure on their filter-beds—about £40,000. It might be *de minimis non curat* compensation. This was the way his learned friend seemed to have dealt with it. It might be that there ought to be some diminution as regarded this. However it was dealt with, it appeared possible that the Court would make some diminution from what their claim otherwise would have been.

This closed the case; the Arbitrators reserving their award.

The Court then proceeded to deal with the case of the

Southwark and Vauxhall Company.

The original claim of the Company was for £5,674,140; the amended claim amounted to £4,935,520, excluding sinking fund payments, or £4,693,117 after deducting sinking fund payments. No offer was made by the Board.

Mr. BALFOUR BROWNE, K.C., Mr. C. BAGGALLAY, K.C., and Mr. A. DU CANE appeared for the Company; and Mr. FLETCHER MOULTON, K.C., the Hon. J. D. FITZGERALD, K.C., Mr. FREEMAN, K.C., Mr. H. LLOYD, and Mr. A. B. SHAW represented the Water Board. Mr. LEWIS COWARD, K.C., and Mr. W. A. ROBERTSON were retained for the Richmond Corporation.

Mr. BALFOUR BROWNE, in opening, described the parliamentary limits of supply of the Company. There was a great portion of their district which they did not at present supply. A part was supplied jointly with the Lambeth Company, a part the Lambeth Company themselves supplied, and a part was supplied by the Kent Company away to the east of their district. But the Court would see from the plans that there was a considerable portion of their district which was not supplied by the Company at the present time at all. There was also a portion of their district within the limits of the Richmond Corporation, where they supplied water in bulk to the Corporation, which they again supplied in detail. The most important of their works were at Hampton, where the water was taken from the Thames. It was carried through mains to various reservoirs, mostly the Nunhead reservoir; and it was distributed by gravitation over the whole district. The works were at the present time in an excellent condition. He did not think he was wrong in saying that no company supplying London with water had more excellent works than this Company. They had provided works far in excess of their present demand; and they might therefore be in a position to claim prospective value. They had, however, considered the matter very carefully, and had come to the conclusion that prospective value was always such a vague thing, and so difficult to prove, that they proposed to shape their case in this matter upon different lines. Counsel proceeded to narrate the history of the Company. Their first important Act was obtained in 1852; and it repealed the earlier Acts. The limits of their supply were defined; but these were extended by the Act of 1884, and still further in 1894. Originally the Company took their water from the Thames at Battersea; and there was no limit to the quantity they could claim. Under the 1852 Act, they removed their works to Hampton; and by agreement with the Corporation, who were then Conservators of the Thames, they were to pay £300 per annum and were to be at liberty to take 20 million gallons of water a day from the river. They did not remove the whole of their works from Battersea—the intakes only. In 1878, there was some allegation as to the impurity of the Thames; and the Company then promised to pay to the Conservancy a further sum of £2000 a year for additional purity. No further quantity of water was given by the Act. In 1886, they agreed to pay £1000 more to the Conservancy—and this time not merely on the question of purity, but also on the question of quantity; and they were then allowed to take 4½ million gallons a day beyond the 20 millions. Their limit was then 24½ million gallons a day. This agreement was the subject of litigation. In 1894, the payment was increased to £4678; but the quantity of water they might take remained the same—24½ million gallons. In 1895, they were abstracting more than the 24½ million gallons; and proceedings were taken in the Court of Chancery to enjoin them not to take more than this amount. The injunction was ordered to stand over, to give the Company an opportunity of going to Parliament in the following year to get power to take the water. In 1897, they applied to Parliament for leave to take extra water from the Thames; and they obtained a temporary Act authorizing them to do so. The excess quantity was to be paid for at the rate of £191 per million gallons—the money going to the Thames Conservancy. In 1898, the permanent Act was passed; the result being that they were allowed, beyond the 24½ million gallons, to take 45 millions at certain times for the supply of their district. This Act further put them under the sterilization clause. Since that time, they had spent practically very little money under the Act. They stood in a somewhat different position from other Companies, because, although the capital they had expended was sterilized, he thought it was only sterilized for the purpose of income. The average daily quantity of water they were at present using and supplying was 32,473,611 gallons. The population supplied was 848,920 all told. The supply worked out on the last year at 37·46 gallons per head. In 1903 it had been reduced below 35; and they believed it could easily be reduced to 30 gallons per head. At first sight it would seem that they were taking more water from the Thames than they had the right to do before the last Act; but it would be found that since the last Act was passed they had increased their sources of supply by other means to a very large extent indeed. Their present water was derived in this way: First they had 20 million gallons under the Act of 1852 from the Thames, and 4½ millions from the Thames by agreement in 1886. They also derived from their gravel water 3,677,000 gallons a day. They used 177,000 gallons of this for cleaning the filters, which left 3,500,000 gallons from this source. They had a well at Streatham, and from this they were deriving 2 million gallons a day; one at Honor Oak, not at present completed, giving something like 5 million gallons a day; and

one at Merton Abbey, which was only being sunk, and the amount of water there was very large indeed. In the sinking they had been drowned out repeatedly, but at the present time 1 million gallons only was being taken from the well for use. Ultimately it would give 5 million gallons a day. This gave them 36 million gallons of water a day; and that was far in excess of their average daily supply, which was 32,473,000 gallons—and that was without taking a drop of water from the Thames under the Act of 1898. Their sources now were so ample that they did not regard it as at all being necessary to draw water from the river. They had now full statutory power to take the gravel water apart altogether from the 24½ million gallons from the Thames. If they had been let alone, they would have been able to reap the fruit of their expenditure; but the Water Board had intervened. Their total dividend to-day only amounted to 7½ per cent.; while really they could have divided 10 per cent., and have paid large arrears of dividends. Their maximum total dividends were £120,000, and their income £104,000 per annum. The total capital of the Company, without debenture stock, was £1,518,000. The total expended was £4,038,778. Their storage was equal to 390 million gallons; and there were reservoirs in course of construction, called the Walton reservoirs, which would hold 1070 millions more. They had to-day, if they excluded the sinking fund, an income of £111,120; but if the sinking fund was to be taken into consideration, their income came to £104,584. They had applied the multiplier which they thought represented the security for this income. Counsel was proceeding to give the particulars of claim, when

Mr. MOULTON drew attention to the fact that the amended claim was made on a totally different basis to the original one.

Mr. BALFOUR BROWNE said the claim was intended to lead to possible negotiations.

The PRESIDENT: Whatever was intended, it seems to be on a different basis entirely.

Mr. BALFOUR BROWNE said the Board made no offer whatever. The claim was intended to be the foundation of an offer. It is only a different way of looking at the same position. He was quite willing to see if they could arrange the question of land valuation; but he did not know that it would be so easy with regard to the works.

The PRESIDENT suggested that a surveyor should be produced on each side, and that the Court should send down a surveyor paid by the parties jointly, who should give evidence.

Counsel agreed to the suggestion.

Mr. BALFOUR BROWNE said he would leave the question of land and deal with the works. The Company had now a large amount of surplus water which would earn a dividend much in excess of £104,000. Their total claim for works, &c., was £397,716. Having gone through the main particulars of the claim, Counsel concluded by asking the Court to say that their claim was worth first, the capitalized value of their present income, and, secondly, the surplus lands. Although the Company had changed the method of their valuation, they were asking practically the same thing.

Mr. *A. Newton*, the Accountant of the Company, gave evidence as to the preparation of the tables put in. The total capital was £1,518,000. The capital account was overdrawn in 1902 by £9834. The population in the Company's district had increased from 1882 to 1892 by 133,000; and the increase in capital expenditure for the same period had been £576,290. Witness was taken through and explained tables dealing with the capital, &c.

Forty-First Day—Tuesday, Jan. 26.

The PRESIDENT said the Court could not help feeling that the mode in which Mr. Balfour Browne proposed to deal with the basis of claim of the Company was a highly inconvenient one, as future profits on works and machinery were not shown. They should inquire into prospective profits as well as past; and this method of valuation ought to be followed.

Mr. BALFOUR BROWNE said he was quite prepared to produce evidence as to the probability of future profits. It was merely a different aspect of the same question, and they already had figures prepared putting the claim on the other basis. Of course, this was only so far as the machinery was concerned and not the land, which was entirely a separate matter, and did not depend upon their future prospects.

Mr. *Newton* was then further examined by Mr. BALFOUR BROWNE upon two other tables. The only difference between them was that in the one they treated the undertaking as subject to the sinking fund, and in the other they excluded it. That which excluded the sinking fund payments was as follows:—

I.—Capitalized value of claimed net income £111,120 × 36·36 . . . . . =	£4,040,323
II.—Capitalized value at Sept., 1904, of estimated increase of net divisible income (up to maximum) reached in 1905 discounted back (£13,057, value £12,914) £12,914 × 36·36 =	469,553
	£4,509,876
III.—Amount available (after paying maximum dividends) for payment of deficiencies in previous dividends based on estimated increase of net income (£1,335,291 discounted back) .	895,954
	£5,405,830
IV.—Allowance for cost of reinvestment, to cover brokerage and stamps, 1 per cent. on £5,405,630	54,058
V.—Allowance for recoupment of loss of interest pending reinvestment, 1 per cent. on £5,405,630	54,058
	£5,513,946
VI.—Allowance for covering costs, charges, and expenses incurred, and to be incurred, in consequence of the passing of the Act of 1902, up to and including the dissolution of the Company	Reserved.
Total amount of claim	£

The table of the alternative claim (after deducting sinking fund payments) showed a total of £5,364,437, allowance for covering costs, &c., reserved.

Mr. MOULTON (to witness): Do you seriously put before this tribunal that an undertaking which had been in the state it was, and which got the Act of 1898, is to be valued on something like an income of 10, 11, or 12 per cent.?

Witness: I do.

In further cross-examination, witness said there would be a saving of £15,105 per annum from the closing of the Battersea works. The capital powers of the Company would be exhausted in 1918.

In re-examination by Mr. BALFOUR BROWNE, witness adhered to the opinion that, notwithstanding drawbacks, the Company's income had showed a steady increase.

Mr. *J. W. Restler*, the Chief Engineer of the Company, in answer to Mr. BAGGALLAY, said the Company's area of supply, which was extended in 1884, was 50½ square miles in extent. He put in tables showing the average daily supply, the number of houses supplied, and the population and gallons supplied per head per day during each of the five years ending Sept. 30, 1902. In reference to the question of population, the Company originally based their figures upon the number of supplies multiplied by 7·43. They still continued their returns to the Water Examiner on this basis after the year 1892; but, without informing the Company, he inserted in his return a different figure based on various factors each year. In 1897, he communicated with the Company on this matter; and they agreed, as from January, 1898, to make their return to him on a basis of 6·71 suggested by him. He had in all cases taken 6·71 as the basis; but it was only fair to point out that the acceptance of this figure showed that the Company's supply per head was higher in reality than it was. In taking 35 gallons per head as a basis for future requirements, it was rather over than under the mark. Witness proceeded to give the actual quantity of water which the Company were legally entitled to take under their several Acts of Parliament, exclusive of the powers given them by their Act of 1898; and this showed a total of 43 million gallons per day. He then went on to describe the various works of the Company. The Company's practice had been to keep all their works and mains in complete order out of revenue, and not to have an annual depreciation fund. The practice had been also to keep both well ahead of any possible requirement. As to the quality of the water, he accepted completely the statements made in the report of Lord Balfour's Commission. This report stated, among other things, "that all possible vigilance should be exercised to prevent unnecessary contamination of the Thames, to ensure the thorough treatment of all sewage before passed into the river, and to enforce adequate storage and filtration of such water as is abstracted at the intakes." Having shown what had been done and how it had effected the quality of the water, witness stated that down to May last year the supply of the Company was equal, and in many cases superior, to that afforded by many of the Thames Companies. In order to make clear their position from an engineering point of view, he stated that the Company generally had to be in a position to supply their statutory district for a reasonable number of years in the future. In 1902, the average daily supply was 31,803,724 gallons; the average number of supplies, 126,517; the average population, 848,920; and the gallons per head per day, 37·46. The future supply was based on 126,517 supplies, with an annual increase of 1254 supplies, and 35 gallons per head per day.

Forty-Second Day—Thursday, Jan. 28.

Mr. BALFOUR BROWNE drew the attention of the Court to a paragraph which appeared in the "Daily Chronicle" for Jan. 25.

The PRESIDENT said he would repeat what he had said before—that it was highly improper for any newspaper to comment upon the proceedings in the Court.

Mr. *Restler* was further examined by Mr. BAGGALLAY as to detailed expenditure on works, and cross-examined by Mr. MOULTON upon the points raised. He said the supply from the wells had increased from what it was in 1894-5; but the quantity pumped from them had not increased. He doubted very much whether the water from the gravel was water from the river. Witness proceeded to give evidence respecting the various works made under the different Acts of the Company. The total cost of the 46-inch main from Hampton to London, 11 miles in length, laid in 1897, was £268,572, of which £268,000 had been charged to revenue. The main had given a considerable amount of trouble through leakage; and it had been necessary to put double bolts throughout almost its entire length. They could not account for the trouble in any way except that the soil in which it was laid must have given way at points. Last year £4000 had to be spent on repairs. He considered the main to be now in a thoroughly satisfactory state. The altered conditions of the supply which had taken place showed that the amount of water in future would be materially reduced. The supply per head, which in 1903 was 37·46 gallons daily, would be reduced to 34·15 gallons. For months together the Company did not take any water from the river; they took their supply from the reservoirs. It was cheaper to do this than to take dirty water from the Thames. Every day that it was possible to take water from the storage reservoirs, they took it. Latterly, the Company had had to shift a large number of their pipes owing to the electrification of the tramways. It was impossible to say that they could lay the pipes in London streets at any uniform depth.

Mr. MOULTON: A large percentage of your pipes are very near the surface?

Witness: A large number have not been exposed; so I do not think anybody can say that.

Replying to further questions, witness said that, with the introduction of the constant system of supply on a large scale in about 1883, it was found that the extra pressure required for fire purposes could not so readily and economically be controlled from the works as hitherto, owing to the fact that increase of pressure meant such a large increase of waste compared with the small effective results obtained. This also applied to the large blocks of modern dwellings and factories, &c. It was therefore decided to provide a distinct and independent high

pressure system, with separate mains and engines, and governed by reservoirs at a sufficiently high level. Accordingly, in 1891 application was made to Parliament for power to spend £20,000 on the extension of this system throughout the district. In addition to this, the Company had, at a large cost and a heavy annual running charge, connected by telephone their central distributing station at Nunhead with the Fire Brigade head-quarters at Southwark, and with the district stations at Clapham and New Cross. The Company's practice had been to keep all their works and mains in complete order out of revenue, and not to have an annual depreciation fund. In 1891, the Company possessed storage reservoirs capable of holding 66 million gallons; in 1903, the amount was 390 million gallons. In 1891, the Company's filtering area consisted of 14½ acres, 11¼ of which were at Battersea, and 3¼ at Hampton. In 1903, the area was 23 acres—all at Hampton The Wandsworth works were only used as a stand-by in case of emergency.

Professor *Dewar* stated that the supply of the Company at present was good. On one or two occasions in 1903 the water was not satisfactory; but it had now recovered its normal quality. The filtration of the Company had improved enormously since 1895. The microbe *B coli communis* was now found to be so widely distributed as not to be regarded as dangerous.

Mr. BALFOUR BROWNE: Then you do not regard this as a substantial danger in water?

Witness: No.

Replying to a further question, witness said they had no specific bacteriologist; they did this for their own information.

Mr. BALFOUR BROWNE: As between the Company and the public, what you desire to ascertain is the character of the water distributed?

Witness: Yes.

And this is got by taking the samples of the water before it goes to distribution?—That is so.

But for the guidance of the Companies themselves you occasionally take samples at the filter-beds to see that they are doing their duty?—Yes, as much as possible in secret, in order to give the Engineer information as to the working of each individual filter.

Professor *Hull* said he had examined the sources in the Thames Valley from the chalk to London; and he had personally inspected the pumping-stations of the Southwark and Vauxhall Company. He went on to explain what he anticipated would be the quantity of water obtained by the Company from each source.

Forty-Third Day—Friday, Jan. 29.

Professor *Edward Hull* stated, in the course of his evidence, that he had considered the supply of water from the chalk as concerning the area south of London for many years on different occasions. He had personally inspected the pumping-stations of the Company. Witness then went on to describe the various works of the Company, and the output of the wells.

Mr. BAGGALLAY: You have taken into consideration the very large area of chalk from which the water is being supplied to the wells?

Witness: Yes; and this is one of the strongest reasons for believing in the great amount of water to be obtained from them.

Replying to Mr. MOULTON, witness said that, taking the Nunhead boring, the fraction that would be drawn, he estimated, was 15 million gallons. This was the minimum. It might be considerably more if a well was put down instead of a boring.

Mr. MOULTON: Do you think you could get this from the boring itself?

Witness: Certainly 1 million gallons, and perhaps 1½ millions.

You know nothing about any wells except what Mr. Restler has said?—That has impressed my mind to some extent.

Sir *William Crookes* said he had been associated with Professor Dewar in taking samples of the London water, including that of the Southwark and Vauxhall Company. The quality of the water of this Company was, as a rule, very good. He might say that it had always been good. There was a certain amount of deterioration in June last and towards the latter months of the year. Excepting at these particular times, he had found it a very good potable water.

Mr. BAGGALLAY: I think that since 1897 you have at no time, with the exception of the particular periods to which you have referred, had to report that the water has not been perfectly clear and bright.

Witness: No. There was one sample which was not clear and bright in 1897; but with few exceptions it has kept clear and bright. The filtration has been excellent; and this is proved to be so by the absence of turbid samples and of complaints.

Witness then put in a table of the monthly average of brown coloured water, and explained the method adopted by the Analysts. He said the public did not like the brown colour of the water, so they took samples; and if there was any brown in the water, they warned the Companies. Really the colour was no test of anything being wrong with the water so far as regarded its potable qualities.

Mr. BAGGALLAY: Now, from your bacteriological examinations you have not been able to find anything wrong in the water of this Company in any recent year?

Witness: I think in our laboratory we have made over 40,000 bacteriological examinations of water. We have never once found pathogenic organisms in the water. We have found *B. coli communis;* but I do not think bacteriologists attribute as much importance to this now as they formerly did. Specific tests had been made for *enteriditis sporogenes;* and on the whole the result was very satisfactory.

Mr. MOULTON: Do you say that you attach no importance at all to the brown colour?

Witness: No; except that the water is offensive to the eye, and therefore distasteful. I attach importance to it from that point of view—what I may call the sentimental point of view.

Do you attach any importance to the *B. coli*?—I attach importance to it in this way. It has been found now to be one of the most widely distributed. It is found in pretty nearly all natural waters. I believe it has been detected in rain water, and in pretty nearly every article of food. If it is present in water in very large quantities, I should look upon it as dangerous; but there must be some abnormal cause if it is in larger quantities than the water would naturally have it.

Forty-Fourth Day—Saturday, Jan. 30.

Mr. *James Mansergh* gave evidence as to recent examinations of the Company's works, which he said were in excellent condition, and had been enormously improved. The capacity of the reservoirs for the storage of 390 million gallons was sufficient for dealing with the 24½ million gallons of water drawn daily from the River Thames. The filtration area was adequate, and the plant excellent.

Mr. *Charles Hawksley* also said he had inspected the works and pumping-stations. The works were in excellent condition. He thought the consumption in the future could be reduced to 30 gallons per head, allowing an adequate supply for all domestic and trade purposes.

Mr. *E. M. Eaton* and Mr. *H. Rofe* testified to the same effect.

Mr. *E. K. Burstal* was then examined with regard to the capacity of the wells.

In cross examination by Mr. MOULTON, he said he did not agree that after the wells had been pumped to the extent of 5 million gallons there was a sudden fall in the water-level. There might be a drop for a time; but the water quickly regained its usual level. The water-level under London was about 100 feet below the River Thames.

Mr. BALFOUR BROWNE remarked that, subject to evidence as to the value of the lands, this completed the case for the Company. With regard to the land, he might say that there was not much difference between the valuations at present.

Mr. MOULTON, in opening the case for the Water Board, submitted that the claim was made on a totally wrong basis, and, further, that the Company had entirely neglected the terms on which they obtained the Act of 1898, by which the sterilization clauses had been rendered practically inoperative. In 1894, the Company went to Parliament, and received powers for new works. A large portion of the works at Hampton were based on the 1894 Act. They had the right to make a storage reservoir and large filtration beds, to put up additional engines, and to expend a large amount of capital upon the general purposes of the Company. The reservoir was to have been made at Honor Oak. It was not yet finished; and its completion would probably cost £130,000. By the Act of 1898, the Company were given power to take excess water from the River Thames. Parliament then recognized that the Company's circumstances were quite exceptional, and different from those of any of the other undertakings; and they made the sterilization clauses distinctly severe—indicating that for ten years the Company should have no additional value arising from the powers conferred on them by the Act of 1898. Practically, Parliament said they would give the Company the means to go on so as to fulfil their statutory obligations; but their value, so far as the additional powers were concerned, should be sterilized. The Act of 1898 merely authorized the taking of more water for the purpose of supplying the district. At that time, the Company had not got beyond the Streatham well; they had no well to yield them a gallon of water. He contended that the whole of the case was based upon the 1898 Act. The Company were, of course, so far as compensation went, entitled to any capital expenditure since 1898, but not to the revenue expenditure. He commented on the quality of the water, and undertook to call scientific witnesses to prove that it was not properly filtered. He disputed the possibility of the Company being able to reduce the present rate of supply per head.

The Court then adjourned until yesterday (Monday).

Opposition to the Crystal Palace Gas Bill.—The Camberwell Borough Council resolved on Wednesday to petition against the Crystal Palace District Gas Company's Bill; and the Town Clerk was authorized to appear to support the opposition. The London County Council will also oppose the Bill.

Fatality Through the Bursting of a Water-Main.—An extraordinary fatality has just occurred at Staveley, near Kendal. The work of laying a second row of iron pipes close alongside the line that conveys water from Thirlmere to Manchester is in progress just outside the village, and a few days ago a man named Joseph Matt was standing on the bank of the cutting, immediately above the old pipes. Suddenly a pipe beneath him burst, making a great rent in the surface, and scattering *débris* of rock about, the water pouring out in great quantities. The man was seen to be lifted from the ground, and he then disappeared, as though he had been drawn into the pipe. When the water was shut off, the work of clearing the cutting was begun, and continued during the night; it being thought possible that the body had been thrown among the accumulations of rock. It was eventually found some 40 feet inside the pipes.

Opposition to the Doncaster Corporation Bill.—A special meeting of the Wheatley Urban District Council was held at the Board School on Wednesday, for the purpose of considering the Bill promoted by the Doncaster Corporation, for carrying out various improvements, and the extension of the supply of gas, water, and electricity into surrounding parishes. The Clerk read a letter he had written to the Town Clerk of Doncaster, asking for the insertion of a clause or sliding-scale to regulate the price to be charged for gas in Wheatley. The Council also desired that their right to apply for a Provisional Order shall not be prejudiced by the Bill. They further wished to reserve the right to specify the position in which the mains and cables shall be laid in the roads, and to have a protection clause in case of widening, improving, or altering roads. They also thought that the Bill should be so amended as to ensure a copy of the Corporation accounts to be transmitted to the Local Government Board being sent to the Council. The Town Clerk replied that the Corporation Parliamentary Committee regretted that they could not agree to the insertion of a clause regulating on a sliding-scale the price of gas in Wheatley. They were willing, however, to give an undertaking not to charge more in the urban district than was for the time being charged within the borough. They were also willing that the usual clauses as to the laying of mains and cables should be inserted; and they did not think there was any objection to the Council having copies of the Corporation accounts. Notwithstanding these expressions of opinion, it was decided that the Council should oppose the Bill.

BRICKS FROM GAS-WORKS CLINKER.

Our readers are aware that for some time past experiments have been in progress at the New Wortley Gas-Works of the Leeds Corporation, under permission given by the Corporation to the Chairman of the Gas Committee (Alderman Lowden), with a view to utilizing the foul gas lime and clinkers produced on the works, the removal of which has hitherto entailed on the department a cost of between £2000 and £3000 a year. Temporary plant was erected at the works more than two years ago, and the experiments carried out by Alderman Lowden and Mr. John Bond, the Manager of the works, appear to have been attended with so much success as to justify embarking on the manufacture for commercial purposes. Expert opinion goes to show that this new product will be a good marketable commodity. Bricks and slabs have been made up to a certain stage by the usual methods; but a very important feature of the process is the lessening of the cost of production from the fact that no kiln-burning is necessary—the hardening being obtained by other means.

Before deciding to erect plant capable of producing bricks and slabs on a large scale, the Residuals Sub-Committee asked a number of leading architects and builders in the city to try the bricks, and report as to their utility for building purposes. At the meeting of the Gas Committee last Wednesday, Alderman Lowden presented a report giving detailed analyses of the bricks—among others by Mr. Bond and Professor Goodman, of the Yorkshire College. The latter said the bricks gave excellent results, both in tension and compression; while Mr. Butler Wilson, the President of the Leeds and Yorkshire Architectural Society, described the bricks as dark slate blue in colour, similar in shade to "Blue Staffordshire," and suitable for use as a building material wherever blue brick can be employed. The other reports all testified to the excellence of the bricks for all purposes where strength and durability are of more importance than appearance. In view of this testimony, the Sub-Committee considered that tenders should be invited for erecting the necessary plant for manufacturing the bricks; and the full Committee adopted the suggestion. It is believed that the process will ultimately become a source of considerable profit to the Corporation, both in the supply of bricks for building purposes and in slabs for street pavements.

The Southport Appointment.—Upwards of 50 applications, from England, Scotland, and Wales, were sent in for the position of Gas Engineer and Manager to the Southport Corporation, rendered vacant by the resignation of Mr. John Booth. At the meeting of the Gas Committee last Tuesday, it was decided to leave to a Sub-Committee the task of selecting some of the most suitable candidates. This they did at a meeting on Friday, when more than 40 were struck out of the list.

GAS AND RESIDUALS PRODUCTION IN THE UNITED STATES.

A report lately issued by the United States Geological Survey furnishes statistics in regard to the production of gas, tar, and ammonia in the fiscal year 1902, compared with similar figures obtained for the year 1898. The following are some extracts from this interesting document.

Dealing first with the production of gas, returns were furnished from 533 companies, distributed over 44 States and territories, and they contained the particulars given in the following table; the figures for the year 1898 being obtained from 433 companies:—

Gas Supply Statistics.

	Year 1898.		Year 1902.
Coal carbonized, short tons	2,042,698	..	5,015,511
Gas made, cubic feet	19,469,464,857	..	30,764,625,332
Gas made per ton of coal, cubic feet	9,465	..	[not given]
Gas sold for illuminating purposes—			
Cubic feet	15,955,149,507	..	23,401,318,526
Value	$18,953,144	..	$23,688,963
Average price per 1000 cubic feet	$1·188	..	$1·012
Gas sold for fuel purposes—			
Cubic feet	2,476,051,907	..	5,677,755,029
Value	$2,546,181	..	$5,653,918
Average price per 1000 cubic feet	$1·0295	..	$0·996
Gas sold, total—			
Cubic feet	18,431,201,414	..	29,079,073,555
Value	$21,502,295	..	$29,342,111
Average price per 1000 cubic feet	$1·1666	..	$1·009
Gas unaccounted for, cubic feet	1,038,263,543	..	1,685,551,777

It will be seen that of the total quantity of gas produced in 1902, 1,685,551,777 cubic feet, or 5·48 per cent., was lost by leakage or accident. The marketed product amounted to 29,079,073,555 cubic feet, of which 23,401,318,526 cubic feet, or 80·45 per cent., was sold for illuminating purposes, and 5,677,755,029, or 19·55 per cent., for fuel. As a usual thing, the gas sold for illuminating purposes brought higher prices than the fuel gas; but there were a few instances where the latter gas was sold at figures high enough to make the average price for this gas higher than that of illuminating gas. The price of this gas varied from 65·2c. per 1000 cubic feet in Massachusetts to $2·13 in Montana, Nevada, and New Mexico. Fuel gas ranged from 29·2c. in West Virginia to $1·98 in Oregon. The average prices of fuel and illuminating gas in 1902 for the country as a whole show a difference of only 1·6c. per 1000 cubic feet; the former being 99·6c., and the latter $1·012. There were, however, very decided differences in the

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prices in some of the States—West Virginia, for instance, having an average of 84·6c. for illuminating gas and 29·2c. for fuel gas.

When arranged according to rank in the quantity of gas produced from coal in 1892, New York stands first, with a production of 5,185,539,000 cubic feet; Massachusetts second, with 4,284,388,000 cubic feet; Ohio third, with 4,278,015,000 cubic feet; and Pennsylvania fourth, with 2,296,311,000 cubic feet. In 1898, these four States also stood at the head of the list; but Massachusetts in that year was fourth in rank, with Pennsylvania second and Ohio third. The construction of the plant of 400 Otto-Hoffman ovens at Everett, near Boston, by the New England Coke and Gas Company, which was completed in 1899, is responsible for an increase in the production of that State of 160 per cent., and places it next to New York in producing rank, notwithstanding the fact that there was one less company making gas in 1902 than in 1898.

The total quantity of coke produced at gas-works and in retort or bye-products recovery ovens in 1902 was 3,377,763 short tons, of which 1,974,175 tons were produced in gas-works and 1,403,588 tons from retort-ovens. In 1898, the production of coke from such plants amounted to 1,510,724 short tons, of which 1,216,279 tons were produced in gas-works and 294,445 tons from retort-ovens. The total quantity of coal carbonized or coked at the gas-works and bye-products coke-ovens of the United States in 1902 amounted to 5,015,511 short tons, of which 1,935,348 tons were coked at the bye-product works; leaving 3,080,163 tons as the quantity carbonized at the gas-works. In 1898, the total quantity of coal carbonized was 2,444,995 short tons, of which 2,042,698 tons were coked in gas-works and 402,297 tons in bye-product ovens. Many coal-gas companies are engaged in the electric light business; and coke produced at the gas-works, as well as considerable quantities of tar, is used for firing in the electric light plants. Other coal-gas producers are also makers of water gas; and the coke from the coal benches is used for firing the water-gas plant. Some coke is also used in the carbonization of coal at some of the coal-gas works. It will be noted, therefore, that not all the coke produced at the gas-works is sold, as a large bulk of it is consumed at the works where it is produced.

In 1898, the 433 companies from which returns were received produced about 4,023,000 gallons of tar and 7,152,600 lbs. of sulphate of ammonia. These figures are approximations, though they are believed to be fairly accurate, and are estimated on a basis of 10 gallons of tar and 20 lbs. of sulphate of ammonia to the ton of coal carbonized. Including the output of tar and sulphate of ammonia from retort-oven coke plants in 1898, the total production in that year (reducing the ammoniacal liquor to its equivalent in sulphate) was as follows: Sulphate of ammonia, 31,102,296 lbs.; tar, 28,407,798 gallons. In 1902, the production of ammonia, reduced to its equivalent in sulphate, was 68,248,686 lbs., and the production of tar 53,171,733 gallons—an increase of more than 100 per cent. in the case of sulphate, and of nearly that percentage in the case of tar.

The aggregate value of all the products obtained from the distillation of coal in gas-works or retort-ovens in 1902 was $43,869,440. About two-thirds of this amount, or $29,342,881, was represented by the value of the gas made. The value of the coke produced was $11,267,608; while the tar was worth, at the works, $1,873,966. Most of the ammonia produced was sold in the form of ammoniacal liquor, which varied widely in strength—ranging from 1·72 oz. to 35·83 oz. of ammonia per gallon. The total quantity of liquor sold was 49,490,609 gallons, containing 14,683,374 lbs. of ammonia, and was worth, at the works, $1,065,300. In addition to this, there was an actual production of 11,276,502 lbs. of sulphate, which sold for $319,685.

The total output of tar from gas-works and bye-products ovens in 1902 amounted to 53,171,733 gallons, valued at $1,873,966, or 3·524 c. per gallon. In 1898, the production from gas-works alone was some 24,384,798 gallons, worth $902,400, or 3·7 c. per gallon. The price in 1902 varied from 2·7 c. in Alabama to 10 c. in Oregon. The lowest price reported in 1898 was 2·23 c. in Indiana, while the highest was 10·17 c., in Montana and New Mexico. From this it will be seen that, on the whole, the value of the tar produced has not changed materially since 1898. It will be seen from the following table that the largest production of tar in 1902 was in Massachusetts, with New York second, Ohio third, and Pennsylvania fourth. In 1898, New York held the first place, with Pennsylvania, Ohio, and Massachusetts following in the order named.

State.	Year 1898. Quantity. Gallons.	Year 1898. Total Value.	Year 1902. Quantity. Gallons.	Year 1902. Total Value.
New York . . .	4,799,740	$184,012	7,076,743	$204,312
Pennsylvania. .	4,163,103	109,317	6,268,805	190,527
Ohio	3,901,258	120,603	6,422,820	251,016
Massachusetts .	2,518,219	134,901	7,985,640	239,954
Wisconsin. . .	1,267,258	29,224	1,928,033	66,896
Michigan . . .	685,589	24,993	2,321,867	75,290
Illinois. . . .	674,758	20,751	1,852,781	84,003
Indiana . . .	624,482	13,948	1,054,271	39,763
New Jersey . .	325,921	12,303	1,351,126	45,514

With regard to the figures for 1898, it should be mentioned that, in ascertaining the total production of coal tar, all the returns were added together; but in determining the yield of tar per ton of coal, due regard was given to the fact that some companies reported coal carbonized, but did not report the amount of tar made therefrom. This bulk of coal was therefore deducted from the total quantity carbonized before an estimate was made of the yield of tar per ton of coal. The actual amount of coal carbonized in making the 24,384,798 gallons of tar was 1,942,963 tons, inasmuch as there was no tar returned from 99,735 tons of coal used. The actual yield of tar per ton of coal, based on the returns made, was 12·55 gallons, obtained by dividing the number of tons of coal used in making tar into the total number of gallons of tar reported.

Of the 533 companies from which reports were received in 1902, only

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106 reported the recovery of ammonia, either in the form of ammoniacal liquor or as sulphate. From these companies a total production of 49,490,609 gallons of liquor, which sold for $1,065,300, and 11,276,502 lbs. of sulphate, which sold for $319,685—a total value for the ammonia sold of $1,384,985. The total quantity of coal carbonized or coked at the works operated by the companies in 1902 was 4,077,478 short tons. The companies who produced liquor used 3,436,312 tons of coal; and 641,166 tons were carbonized by the companies selling their ammonia as sulphate. From this it appears that the average yield per short ton of coal carbonized was 14·4 gallons of liquor and 17·6 lbs. of sulphate. The liquor is sold in several ways. Some companies reported the production in liquor-ounces, selling at a certain price per 100 liquor-ounces of a specified strength; others reported production in gallons, sales being made at a certain price per pound for pure ammonia; while others reported the production in gallons of ammoniacal liquor at so much per gallon, giving the strength of the liquor. The strength of liquor was reported by some producers in ounces, by others in degrees Twaddel, and by others in percentage of anhydrous ammonia. In the report on this subject prepared by Dr. W. B. Phillips, and covering the year 1898, the total amount of ammoniacal liquor sold by 70 establishments from which returns were received was reported at 25,749,792 gallons, which fetched $284,148. This production, reduced to its equivalent in sulphate of ammonia, is estimated to have been 23,949,696 lbs. The sulphate equivalent of the 49,490,609 gallons of liquor sold in 1902 was 56,972,184 lbs., which added to the 11,276,502 lbs. of sulphate separately reported, would be equal to a total production of 68,248,686 lbs. of sulphate.

The report concludes as follows: "Comparatively little progress in the manufacture of chemical products from coal tar has been made in America. Though there are being produced over 50 million gallons of coal tar annually, the principal uses made thereof are in the manufacture of roofing paper, the creosoting of lumber, and for the preparation of street-paving material, while at the same time there are being imported millions of dollars' worth of chemicals obtained from coal tar as a raw material. The coal tar produced in 1902 was worth at first hand $1,873,966. In the fiscal year ended June 30, 1902, the products imported into the United States were worth, at points of shipment, $7,494,340. The duty paid on these imports amounted to $1,594,799; making the total cost, exclusive of freight, other expenses, and jobbers' profits, $9,089,139. In the fiscal year ended June 30, 1903, the value of these imports was $7,630,895, with a duty of $1,692,445; making a total of $9,383,330. A conservative estimate would place the total value of these products in the wholesale markets of America at $12,000,000, in both 1902 and 1903. The following figures show the value of the coal tar products imported into the United States in the fiscal year 1903: Salicylic acid, $19,012; alizarine and colours or dyes, natural and artificial, $660,464; aniline salts, $789,553; coal tar colours or dyes not specially provided for, $5,252,611; coal tar preparations, not colours or dyes, $544,176; coal tar products, not medicinal and not dyes, known as benzol, toiuol, &c., $425,019—total $7,690,885."

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

So far as this side of the Border is concerned, the last has been heard meantime of the action by the New Conveyor Company, Limited, against the Edinburgh and Leith Gas Commissioners. It was, as reported in another column, disposed of with short shrift in the Second Division of the Court of Session on Tuesday. The hearing did not last fifteen minutes—so short, indeed, that the customary books of reference had not been brought forward. As to this, however, it is open to observe that the result was probably foreseen, and that therefore no arrangements were made for supporting argument by quotation. Whether that be so or not, the Judges of the Second Division soon perceived that it was about as broad as it was long, in the matter of costs, to dismiss the action at once; leaving it to the pursuers to put their patent in order and to then bring a new action, if so advised, rather than to keep the action in Court while the pursuers applied to the Patent Office for an amended specification. The Gas Commissioners have got a decree for their expenses; and if they require to meet a new litigation, they will have the advantage, in this respect, that, however it might go, they would not have to bear the expenses of the proceedings up to this point.

Everyone who reads the memoranda prepared by Mr. W. R. Herring, relative to the conditions of working in the Granton Gas-Works, given in another column, must, I consider, be satisfied as to the positive unreasonableness of the demands of the men. There is no need to say hard things of the men, who, probably, are not aware of the part they are playing. The hardest thing, perhaps, which can be said is that they are acting, not so much in their own cause as in the working-out of a plan laid down by men who affect to lead them. The underlying principle of this plan is to prevent the employers from getting the benefit of their enterprise in the construction of new works. The disputed point is the old one which has led workmen in many fields of industry to resist the introduction of machinery. If the men could read and understand history, they would be aware that such attempts have always been worsted; and they might be the more easily convinced that their movement will share the same fate. This must be the conclusion upon the general question; but that conclusion is made unmistakable when the document is read, and it is seen how great are the advantages which the men at Granton possess over other workmen in their walk of life, and the spirit, not merely of fairness but of generosity, in which they are treated. If they only knew it, they are veritable princes among the labouring classes. The vote of the men upon the question of Sunday labour is, I suppose, more the result of direction from some headquarters or other than of conviction on their part as to the keeping of a Day of Rest. I do not yet know what resulted from the meeting of the Committee with the men on Wednesday; but surely the men will not throw away their best chance in

CARBURETTED WATER-GAS APPARATUS

Merrifield—Westcott—Pearson Patents.

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The above Company have erected since 1893, or are now erecting, their Universal Type of Carburetted Water-Gas Plant at the following Gas-Works:—

	Cub. Ft. Daily.		Cub. Ft. Daily.		Cub. Ft. Daily.
BLACKBURN.	1,250,000	ST. CATHERINES (Remodelled) .	250,000	ACCRINGTON.	500,000
WINDSOR ST. WORKS, BIRMINGHAM	2,000,000	KINGSTON, PA.	125,000	TONBRIDGE	300,000
SALTLEY WORKS, BIRMINGHAM	2,000,000	PETERBOROUGH, ONT. . .	250,000	STRETFORD	500,000
COLCHESTER	300,000	WILKESBARRE, PA. . . .	750,000	OLDBURY	300,000
BIRKENHEAD	2,250,000	ST. CATHERINES (Second Contract)	250,000	TODMORDEN	500,000
SWINDON (New Swindon Gas Co.)	120,000	BUFFALO, N.Y.	2,000,000	SALTLEY, BIRMINGHAM (Third Contract)	2,000,000
SALTLEY, BIRMINGHAM (Second Contract)	2,000,000	WINNIPEG, MAN. . . .	500,000	YORK (Second Contract) . .	750,000
WINDSOR ST., BIRMINGHAM (Second Contract) . . .	2,000,000	COLCHESTER (Second Contract)	300,000	ROCHESTER (Second Contract) .	500,000
HALIFAX	1,000,000	YORK	750,000	NEWPORT (MON.)	250,000
TORONTO	250,000	ROCHESTER	500,000	TOKIO, JAPAN	1,000,000
OTTAWA	250,000	KINGSTON, ONT.	300,000	PERNAMBUCO (Brazil) . .	125,000
LINDSAY (Remodelled) . .	125,000	CRYSTAL PALACE DISTRICT .	2,000,000	MALTON	150,000
MONTREAL	500,000	DULUTH, MINN.	300,000	DULUTH, MINN. (Second Contract)	300,000
TORONTO (Second Contract Remodelled)	2,000,000	CATERHAM	150,000	BROCKVILLE (ONT.) . . .	250,000
BELLEVILLE	250,000	LEICESTER	2,000,000	SMETHWICK	500,000
OTTAWA (Second Contract). .	250,000	ENSCHEDE (HOLLAND) . .	150,000	GRAVESEND	300,000
BRANTFORD (Remodelled) . .	200,000	BUENOS AYRES (RIVER PLATE CO.)	700,000	NEWPORT MON. (Second Contract)	250,000
		BURNLEY	1,500,000	TORONTO (Third Contract) . .	750,000
		KINGSTON-ON-THAMES . .	1,750,000	TORONTO (Fourth Contract)	1,000,000

Complete Gas-Works at NELSON, BRITISH COLUMBIA.

LEEDS, 1,800,000 C. Ft. LEICESTER (2nd Cont.), 1,000,000 C. Ft. NEWCASTLE-ON-TYNE, 1,800,000 C. Ft.
MONTREAL, ONT. (Second Contract), 1,800,000 C. Ft. HAMILTON, ONT., 400,000 C. Ft.

life, including the prospect of a pension, at the bidding of anyone outside the works. The men ought to know on which side their bread is buttered; and I think it would be conceded by most who read Mr. Herring's memoranda that he has buttered it pretty thick for them—much thicker, indeed, than any other employer in the country.

The report as to their investigations into the use of carburetted water-gas plant which the Gas Committee of the Dundee Town Council instructed Mr. G. Stevenson, their Convener, and Mr. S. Yuill, the Engineer and Manager, to submit to them (referred to in my "Notes" last week), has been prepared. Mr. Stevenson gives the narrative, and Mr. Yuill the conclusions. On their tour, Mr. Stevenson and Mr. Yuill visited Preston, and then went on to Liverpool, where they saw Mr. King, the Gas Company's Chief Engineer. At Manchester, they had an interview with Mr. Newbigging; and at Derby they saw the De Brouwer projector. Being designed for a Committee of laymen, the report contains much that is quite familiar to readers of the "JOURNAL." The De Brouwer machine is new; and what was said about it may not be well known. The machine is working on a bench which is old; but arrangements are being made to fit it on to a new bench. The cost of the machine, as it is fitted up, was about £1000. Mr. Bell, of Derby, is perfectly satisfied with it. Mr. Yuill says: "The point that impressed me most was the unanimity of opinion of all the gas engineers we had the pleasure of interviewing upon the benefits to be derived from the working of water gas, both from the practical and the financial point of view, and the minimum of risks. The more I study this question, the more I am impressed with the advantages to be derived from an installation of carburetted water-gas plant, both from an economical point of view and the advantages it offers against contingencies." The comparative cost between coal gas and carburetted water gas in Dublin, Manchester, Edinburgh, Tottenham, Brighton, and Durham is set forth in the report. In Dublin, it is stated, coal gas of 11·89-candle power costs 15·37d. per 1000 cubic feet, and carburetted water gas of 25·11-candle power costs 12·63d. In Edinburgh, coal gas of 23·59 candles costs 17·40d., and carburetted water gas 11·72d. In Durham, the cost of 16 24-candle power coal gas is 12·08d., as compared with 13·26d. for carburetted water gas of 21·88 candles. These figures show, Mr. Yuill says, that with carburetted water gas they were able to give 5·54 candles higher than coal gas, at a cost of 1·18d. per 1000 cubic feet, or 0·21d. per candle, which is extremely moderate. In Dublin, which is remote from the source of the coal supply, the comparison is more marked, as they were able to produce carburetted water gas of 25·11-candle power at a cost of 12·63d. per 1000 cubic feet, against 15·37d. for coal gas of 11·89-candle power—or 2·74d. less than the cost of coal gas.

Mr. J. Cuthbert, the Convener of the Gas Committee of the Perth Town Council, reported to a meeting of the Committee on Monday that, in consequence of a report received from the Parliamentary Agents of the Corporation, nothing further could be done with a proposal for the redemption of the gas annuities of the Corporation. The Agents said that, in view of the replies which had been received from the holders of the annuities, they would not recommend the Council to proceed with the conversion. The Committee agreed meantime to depart from the proposal; and it was understood that arrangements will be made for the laying aside annually and investment of the sums which would have been spent upon conversion, so that, at the end of thirty years, the accumulated fund might be sufficient to redeem the annuities, in terms of the Corporation Gas Act of 1871. The annuities payable by the Corporation are at the rate of 6¼ per cent. The capitalized value of annuities is £90,000; but this has been reduced by the operation of the sinking fund to £80,654. This is slow progress in the work of redemption; but, naturally, the holders of a 6¼ per cent. investment, with a first-class security, are not desirous to part with it. Any action in this direction must necessarily come from the Corporation, who, strangely, do not seem to have been very eager upon the subject. But, of course, it is only in recent years that the cheapness of money has brought the matter into prominence.

The electric lighting of Perth by the Corporation is reported to be not a success. It is known that for some months the question of whether the streets which are lighted by electricity should not be restored to a system of lighting by gas, using incandescent burners, has been under consideration. Experiments with a view to the decision of this question have been in progress for some time. They have gone so far that it is ascertained that the area which, to light by electricity, costs £1300 a year, can be lighted by gas at an annual cost of £500; and that, for the larger sum, the light is little, if any, superior to that which is obtained by the smaller expenditure. The Railway Companies are experimenting as to the lighting of their station premises by means of Lucas and other incandescent gas-lamps.

On Friday of last week, the Town Council of Aberdeen paid a visit of inspection to the new electricity works at Ferryhill—the first they had made for nine months Lord Provost Walker said the Council had powers to borrow £250,000, and they had expended upon electricity works in all £230,000. In fact, the Lighting Department was becoming one of the largest departments in the Corporation. Mr. G. Kemp, the Convener of the Committee, said that in 1891, when the electricity works in Cotton Street were projected, it was estimated that they would cost £21,300. At the end of 1894, their first year of working, the expenditure upon the works had amounted to £23,000; and the units generated in that year numbered 72,000. In the present year, only half of which has gone, they have generated 2,014,637 units—practically four times more than they did in 1899, and 28 times more than in 1894. Since the date of their last inspection, the number of units generated had risen 33½ per cent., and the number of consumers 16·3 per cent. Only the other day, the Council sanctioned the erection of another generating set of 1200-horse power, which was not an extravagant order when they knew that not many days before the demand was so great that they had only 1000-horse power in reserve against any breakdown which might have occurred. It might be that before next winter the 1200-horse power they were adding would do no more than they would require; and those who came into power in the

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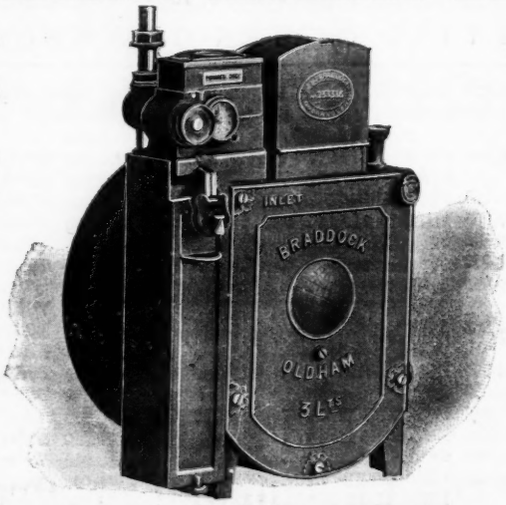

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future would have to face extension. It would appear from these remarks of Mr. Kemp that the unclosed capital account is very much in evidence in Aberdeen; and, what is more, that they are quite pleased with the prospect.

On Monday night, a partial, but exceedingly annoying, breakdown of the electric lighting of Dundee—the second within a few days—took place. About half-past four o'clock in the afternoon, shortly after lighting up, the lights in many shops and offices, and in some of the street-lamps, began to jump down and up, and ultimately they went out altogether. What made the occurrence the more tantalizing was that, while one place was thrown into darkness, the place next door remained unaffected. The Police Office and the Theatre were in darkness, and so was part of the Post Office. In many instances gas lighting was resorted to; but in places where the gas-fittings had been removed, the only resource was candles or oil-lamps. After about four hours, the light was restored. It was explained that the mishap had occurred to an old main which is in the course of being relaid; and it was freely stated that such a contingency was by no means unexpected, although it was hoped that it would not occur.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Jan.* 30.

Sulphate of Ammonia.

There has again been a quiet market, for, although the large makes are fully sold and are being delivered on contracts, demand has been barely enough to remove the smaller makes. There has also been some reselling. Quotations have consequently declined to £12 13s. 9d. per ton f.o.b. Hull, and to £12 15s. to £12 16s. 3d. per ton f.o.b. Liverpool; £12 17s. 6d. per ton remaining the quotation f.o.b. Leith. The forward position has been quite neglected, and quotations are altogether nominal.

Nitrate of Soda.

This has also been rather quiet; but, at the close, spot quotations have been advanced to 9s. 10½d. and 10s. 1½d. per cwt., for ordinary and refined qualities respectively. Heavy deliveries continue to be made from arrivals at Continental ports, so that, although there is not much current business, supplies are getting into the hands of distributors in the interior, and this is a promising feature in the situation.

LONDON, *Jan.* 30.

Tar Products.

There is really nothing very special to report; the markets being generally quiet, with an absence of business. Pitch is still weak, although there has certainly been more inquiry during the last few days; while in some instances business is reported over the last six months of the present year. Some South Wales consumers were buyers for the first six months of the year, but were not as a rule inclined to pay the prices asked by the makers, although some small transactions took place for April delivery. Continental quotations still rule very much lower than prices asked by manufacturers here. Possibly the present depression may induce some consumers to contract forward, as present prices should certainly be remunerative to briquette makers. In benzol, there is really no business to report. London makers appear fairly well sold, and ask 11d. for 90 per cent. in any position. It is, however, reported that country manufacturers accepted rather less than this for prompt and forward delivery. In 50-90 per cent., some quantity was offered at 8d.; but business did not result. Buyers' idea of value being 7½d. delivered. In toluol, there is nothing doing in the ordinary; but small sales of pure are reported at from 10½d. to 11d. The solvent market is decidedly quiet; and makers in the North of England are rather more anxious to sell for prompt delivery, doubtless owing to the increased production. Creosote prices are well maintained in London; there being a good demand for export. But in the North, there is certainly more offering, and prices are easier, especially for early delivery. The demand for carbolic acid continues very good for crude; and business has been done at from 1s. 6¼d. to 1s. 6½d. for February-June. English consumers appear to be taking more interest in this article; and a good deal of business has been done this week for home consumption. In crystals, there is not much doing at present, although prices keep fairly firm all round. The position of anthracene remains unchanged. Several small transactions have taken place for prompt delivery at 1¾d. to 2d., according to quality; but as regards forward, makers decline to consider business at existing values. A good deal of business has been done in light oil lately, but at prices varying from 2½d. to 3½d., as the value almost entirely depends upon whether the carbolic has been extracted or not. The price of tar continues to weaken; and a further decline in value seems likely to take place.

The average values during the week were: Tar, 20s. to 25s. Pitch, London, 35s. to 35s. 6d.; east coast, 33s. 6d. to 34s.; west coast, 32s. 6d. to 32s. 9d. Benzol, 90 per cent., 10½d. to 10⅝d.; 50-90 per cent., 7½d. to 7⅝d. Toluol, 7½d. to 8d. Crude naphtha, 3d. to 3½d.; solvent naphtha, 8½d. to 10d.; heavy naphtha, 11d. to 11½d. Creosote, London, 1⅜d. to 1½d.; North, 1⅛d. to 1⅜d. Heavy oils, 2¼d. to 2½d. Carbolic acid, 60 per cent., 1s. 6d. to 1s. 6½d. Refined naphthalene, £5 to £8. Salts, 24s. to 26s. Anthracene, "A" quality, 1¾d. to 2d.; "B" quality, 1d. nominal.

Sulphate of Ammonia.

The market closes with a decidedly quieter tone, due doubtless to the fact that most dealers have completed their purchases for February. Beckton still quote £13, in any position; but no business of importance has taken place at this price. The South Metropolitan made a sale at £13 2s. 6d. on their terms, and now ask £13 3s. 9d.; but they have not yet been able to realize this figure. In Hull, makers still quote £12 15s. for February; and it is reported that a small quantity has

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The Carburettor is inexpensive, easily fixed, and entirely supersedes the use of Cannel.

Dealers in Benzol, Carburine, and all other Naphthas and Oils suitable for the Enrichment or Production of Gas.

For Prices and full Particulars, apply to

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been placed at this price for prompt delivery. In Leith, there are now sellers at £12 17s. 6d. for prompt shipment; but buyers decline to pay this price at present. Makers, however, do not show any signs of weakness, and are very firm in their ideas for forward. In Liverpool, business has been rather limited. Small sales are reported at £12 16s. 3d.; but at the close buyers would not pay more than £12 15s. for February-March.

COAL TRADE REPORTS.

Lancashire Coal Trade.

The general position throughout the coal trade of Lancashire remains without improvement. Collieries for the most part are continuing on short time; and the demand for all descriptions of fuel is indifferent. House fire qualities still move away slowly for the season of the year; and, notwithstanding the restricted output, supplies are ample. Prices are, however, still held to on the basis of 13s. 6d. and 14s. 6d. up to 15s. per ton for the best qualities, 11s. and 11s. 6d. to 12s. 6d. for seconds, and 9s. 6d. to 10s. 6d. for the commoner sorts. Judging from concessions which in some instances collieries are apparently prepared to make to secure contracts for the lower qualities of round coal, there would seem to be a tendency towards weakness in this class of fuel, which later on may have its effect when the usual gas-coal contracts come upon the market. There is very little just now doing in the way of any large purchasing to test prices; consumers mostly being content just to purchase from hand to mouth at low current rates. There are, however, reports that a contract for 25,000 tons has recently been offered at a reduction of 9d. on last year's rates. One colliery, it is stated, was prepared to give way 6d.; but this did not satisfy the buyers, and the settlement of the contract was left in abeyance. Requirements for steam and forge purposes continue very limited, with current rates about 8s. to 8s. 3d. per ton at the pit for ordinary qualities, up to 8s. 6d. and 8s. 9d. quoted for some of the best descriptions. The shipping demand varies; but it is only moderate, with quotations for steam coals delivered at the Mersey ports or the Manchester Ship Canal ranging, according to quality, from 9s. and 9s. 3d. up to 9s. 6d. and 9s. 9d. per ton. The best sorts of engine fuel are, if anything, rather scarce. Prices are firm at about 6s. 3d. up to 6s. 6d. and 6s. 9d. per ton at the pit, with medium sorts fetching 5s. 3d. to 5s. 6d. and 5s. 9d. Of common slack, however, there are still ample supplies, with a good deal of surplus offering from outside districts; and prices are kept low, ranging from 4s. 3d. to 4s. 6d. and 4s. 9d.

Northern Coal Trade.

There has been some falling off in the demand for certain kinds of coal, and the collieries have not been able to have entirely full work in all cases. In steam coal, which depends largely on the export trade, the dulness is most seen, because exports are limited at the present time. Best Northumbrian steams are quiet at from 9s. 3d. to 9s. 4½d. per ton f.o.b., second-class steams are dull at 8s. 3d., and steam smalls are plentiful at 3s. 9d. to 4s. In the Durham coal trade, with a good inquiry for gas coals, the supply of fuel generally is so abundant that the prices seem to be weaker all round. In the gas coal trade, the contracts take up a large part of the output; and the price of any beyond these quantities varies from about 8s. 3d. to 8s. 9d. per ton f.o.b. There are two or three heavy contracts for gas coal just being settled. The price may be said to be about 6d. lower than a year ago for similar sales; but much depends on the allowance that may be made for the freight of the steamers. The production of gas coke being less than it was, the output is now more fully taken up; and the price is maintained on much the same figures as last quoted.

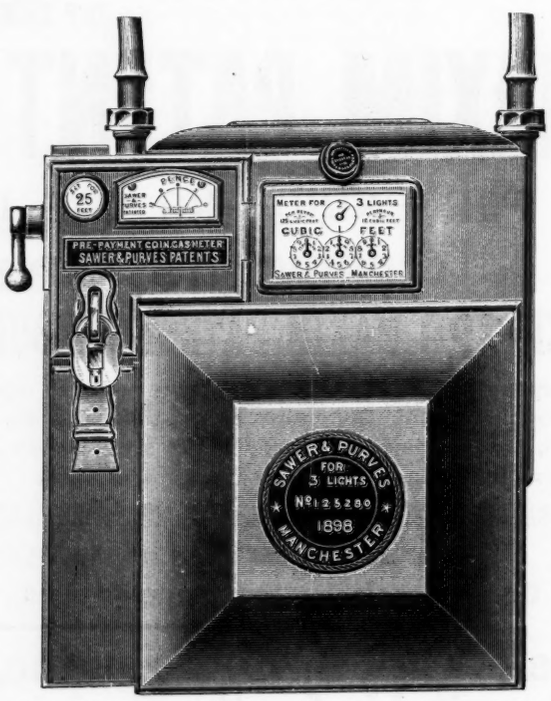
Scotch Coal Trade.

Trade still remains unusually dull; the shipping continuing the worst side. Splint is said to be in good demand, but ell to be quiet and rather pressed upon buyers. The prices quoted are: Main 7s. 6d. to 7s 9d. per ton f.o.b. Glasgow, ell 8s. 6d. to 9s. 6d., and splint 9s. 3d. to 9s. 6d. The shipments for the week amounted to 200,666 tons—an increase of 13,776 tons upon the preceding week, but a decrease of 12,419 tons upon the corresponding week of last year. For the year to date, the total shipments have been 515,294 tons—a decrease of 39,182 tons upon the same period of last year.

A De Brouwer Charger for Lancaster.—Some members of the Gas Committee of the Lancaster Corporation recently visited Derby to inspect the De Brouwer charger in use there. They were so favourably impressed with it, that on their return they recommended its introduction. The Committee accordingly passed a resolution to the effect that the principle of mechanical stoking should be adopted. Alternative tenders were submitted for the supply of a charger, discharger, and the necessary alterations to the retort-house; and it was resolved that the tender of Messrs. W. J. Jenkins and Co., Limited, of Retford, be accepted, at a cost of £3500.

The Electric Light Question at Sidcup.—At a public meeting of the ratepayers of Foots Cray, held at the Sidcup Public Hall a few days ago, a decision was asked upon four resolutions of which notice had been given. They were: "(1) To proceed with the Electric Lighting Provisional Order obtained by the late Parish Council upon the instructions of the ratepayers. (2) To enter into a contract with the Bexley Urban District Council to supply electrical energy in bulk at the boundary. (3) To enter into a contract with the Borough Council of Woolwich to supply electrical energy in bulk at the boundary. (4) To consider proposals for erecting an electric power and lighting station within the urban district of Foots Cray." After a long discussion, the first resolution was declared negatived by a large majority, amid loud and continued applause; and this rendered unnecessary the submission of the remaining three to the meeting. A poll was, however, demanded.

THE ABOVE REPRESENTS THE SIZE OF OUR BUSINESS WHEN THE "POSITIVE" SLOT METER WAS FIRST MADE IN 1889



SAWER & PURVES,

MANCHESTER
AND
NOTTINGHAM.

IT HAS INCREASED IN RATIO TO THE ABOVE, SINCE THE POPULARITY AND PRE-EMINENCE OF THE "POSITIVE" SLOT METER BECAME PRONOUNCED.

Fire at the Eaton Hall Gas-Works.—A fire occurred on Friday morning at the Duke of Westminster's private gas-works on the Eaton Estate, near Chester. A retort in one of the buildings exploded, and the flames at once spread to the ceiling. The Duke's fire brigade was summoned, and quickly got the flames in hand, but not before a portion of the roof fell in.

The Quality of Birkdale Gas.—The long-standing feud between Birkdale and Southport with regard to the quality of the gas supply has at last come to an end. Since the sanction of the supply of 16-candle gas last January, and the adoption by other authorities of the same gas-testing apparatus, the tests have been much more satisfactory. Mr. Bellamy's tests at Birkdale showed 16·37 and 15·55 candles, respectively, which is sufficiently near the standard to satisfy. He has now been asked to discontinue testing for the present; and Mr. J. F. Keeley, the Clerk to the Birkdale Urban District Council, has been appointed to make tests and report thereon.

Natural Gas at Bradford.—The discovery of a supply of natural gas has lately been made at Bradford. For about four years, boring operations have been in progress, by Messrs. Isler and Co., to get a supply of fresh water for the Great Northern Railway Company's locomotive depôt. So far, however, the efforts have not met with success. In the ordinary way, tubes have been sunk as the boring has proceeded, and a few days ago a reservoir of gas was tapped at a depth of 900 feet. It is reported that, on a light being applied, "a brilliant flame shot up to a height of several feet, and has steadily maintained its force and clearness." The quality of the gas is said to be much superior to that of ordinary coal gas.

Gas Preferred to Electricity at Southport.—The subject of the unsatisfactory charges for electricity was freely discussed by the Southport Chamber of Commerce at a meeting on the 29th ult., when Mr. J. H. Preston said that Southport consumers were charged on the Brighton scale, ranging from 6d. to 4d. and 2d. He believed that in Birkdale a fixed price of 5d. was to be made. Mr. E. Woods said he had long been dissatisfied with the charges, and he thought the undertaking would occasion serious loss to the town. People were returning to gas in preference to electricity. The electric-meters were inaccurate; and he gave instances showing that the Corporation officials could not tell whether or not a meter was working properly. An enormous sum of money was sunk in the Southport Electricity Estate, and he could point to four shopkeepers who had had their electric light fittings replaced by gas-fittings. The Chairman (Mr. J. M. Petrie) said he believed the system of charging had been a source of annoyance from the beginning. A deputation was appointed to wait on the Electricity Committee.

Messrs. Thomas Newbigging and Son have been instructed to value the undertaking of the Hyde Gas Company for rating purposes.

Last Wednesday the Chelsea Borough Council decided to include £1500 in the estimates for 1904-5 to further improve the gas lighting of the borough.

The Richmond Gas Stove and Meter Company have recently held successful exhibitions at the following towns: Stafford, Derby, Hanley, Oxford, and Bournemouth.

Messrs. George Waller and Son have just received the contract for six exhausters for the new exhauster-house at the Rochdale Road Gas-Works of the Manchester Corporation.

It is stated that a Syndicate is being organized in London and Paris, with a capital of £10,000,000, for the purpose of operating the Texas oil fields, and to supply European markets.

The St. Austell Gas Company have placed the order with Messrs. Robert Dempster and Sons, Limited, for a steel tank 63 ft. 9 in. diameter by 18 ft. 6 in. deep, and a telescopic gasholder. The contract includes excavation and foundation work.

The St. Louis Oil Company (Indiana), Limited, has been registered in Guernsey with a capital of £350,000, in £4 shares, to acquire the benefit of certain leases of oil-bearing lands in Indiana, and to carry on the business of winners, workers, and refiners of, and dealers in, mineral and other oils, &c.

The inhabitants of Weybridge had cause to be thankful, on the evening of the 23rd ult., that the streets are lighted by incandescent gas, for the electric light failed about six o'clock; and though it was partially restored an hour later, current could not be furnished to the whole of the district till about ten o'clock.

The profits of the Metropolitan Gas Company of Melbourne for the half year to Dec. 31 amounted to £52,000. A dividend of 4s. 6d. a share (payable in Melbourne on the 1st inst.) has been declared for the six months, £14,500 has been added to the reserve fund, and the balance of £3600 has been carried forward.

The Secretary of the Midland Railway Temperance Union (Mr. F. Gelsthorpe, of Derby) has sent us the sheet almanack for the current year issued by the Union. It contains some interesting statistics which show that the Company have 16 coal and oil gas-works, which produced last year 282,742,800 cubic feet of gas from coal and 43,499,400 cubic feet from oil. There are 4695 carriages lighted by gas; and 35,050 incandescent gas-lights are in use.

A vacancy having occurred in the Corporation of Manchester by the death of the representative of Newton Heath Ward, two candidates have been nominated, one of whom is Mr. Fred J. West, the General Manager of West's Gas Improvement Company, Limited. Mr. West addressed the electors for the first time on Thursday, in the Conservative interest, and urged that, as an engineer, his knowledge could not fail to be of value in connection with such municipal undertakings as those connected with gas, electricity, tramways, &c., in which engineering problems had to be dealt with.

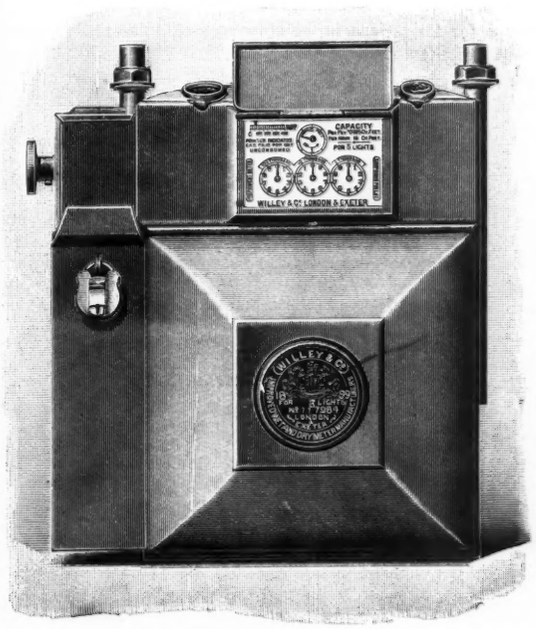
THREE POINTS

of advantage from the many found in our Slot Meters are:

1st.—They are Fraud Proof, and Cannot be tampered with through the Slot.

2nd.—The Slot is closed when the maximum number of Coins have been inserted.

3rd.—Our Price Changing System is the Simplest, Quickest, and most Accurate yet devised.



ALL PARTS INTERCHANGEABLE.

Tens of Thousands in use, and adopted exclusively by many Gas Companies.

WILLEY & CO., LTD., LONDON & EXETER.

We have received from the sole agent for Great Britain, India, and the Colonies (Mr. J. R. Wildman, of No. 17, Albion Street, Leeds) a pamphlet descriptive of MM. Toisoul, Fradet, and Cie.'s patent lighting gas furnace for crematoria. This furnace has already been adopted at Leeds and Bradford, as well as at Rouen, Rheims, and Lyons; and many advantages are claimed for it. It is said that lighting gas is cheaper and cleaner than any other fuel, especially for intermittent incinerations; the system named being guaranteed, starting with the furnace cold, to reduce a body to white-grey ash within five hours, with a maximum consumption of 10,000 cubic feet of ordinary lighting gas from the town mains—the gas to be supplied as required up to a maximum of 3000 cubic feet per hour, at a pressure of at least 25-10ths on the pipe between the meter and the furnace during the time the latter is at full work. This consumption, however, is exclusive of the gas required for a pilot-fire that would be constantly kept alight in the chimney.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

ASSISTANT-MANAGER. Heckmondwike Gas-Works. Feb. 11.
JUNIOR DRAUGHTSMAN. Tottenham and Edmonton Gas Company.
INSPECTOR. No. 4158.
METER INSPECTOR. Ashton-in-Makerfield Gas Department. Feb. 16.
WATER INSPECTOR. No. 4159.
SULPHATE MAKER AND MAIN LAYER. No. 4155.
JUNIOR IN LONDON OFFICE. 63, Chancery Lane.
HANDY MAN. Paignton Gas-Works.

Situations Wanted.

MANAGER AND COLLECTOR. No. 4157.
METER INSPECTOR, &c. 25, Batavia Street, S.E.

Plant, &c., for Sale.

CONDENSER (250,000 feet). Redditch Gas-Works.
LANCASHIRE BOILER. Halifax Gas Department. Tenders by Feb. 12.
STATION GOVERNOR. Hindley Gas Department.

Plant, &c. (New or Second Hand) Wanted.

GAS METERS. No. 4156.
PURIFIERS AND STATION METER. Barrhead Gas-Works.

Company Meetings.

BARNET GAS AND WATER COMPANY. Albion Tavern. Feb. 19. Twelve o'clock.
BARNSTAPLE GAS COMPANY. Barnstaple. Feb. 20. Twelve o'clock.
COMMERCIAL GAS COMPANY. Cannon Street Hotel. Feb. 18. Twelve o'clock.
CRYSTAL PALACE DISTRICT GAS COMPANY. Albion Tavern. Feb. 12. Three o'clock.
TOTTENHAM AND EDMONTON GASLIGHT COMPANY. Offices. Feb. 20. 2 30 o'clock.

Sales of Stocks and Shares.

BOURNEMOUTH GAS AND WATER COMPANY. Feb. 11.
BRECON GAS COMPANY. Feb. 17.
SUNDERLAND AND SOUTH SHIELDS WATER COMPANY. Feb. 25.
WREXHAM AND EAST DENBIGHSHIRE WATER COMPANY. Feb. 8.

TENDERS FOR

Cookers.

PONTYPRIDD GAS DEPARTMENT. Tenders by Feb. 15.

Sulphate of Ammonia Plant.

HINDLEY GAS DEPARTMENT. Tenders by Feb. 15.

Tar.

MANCHESTER GAS DEPARTMENT. Tenders by March 24.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional Line, 6d.

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Telegrams: "GASKING, LONDON." Telephone: P.O. 1571a Central.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 262.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.	GAS COMPANIES.			£ s. d.
590,000	10	Oct. 15	10½	Alliance & Dublin 10 p.c.	18½—19½	..	5 7 8
100,000	10	,,	7½	Do. 7 p.c.	13—14	+½	5 7 2
200,000	5	Nov. 12	6½	Bombay, Ltd. . . .	5⅝—6	..	5 8 4
140,000	5	,,	6½	Do. New, £4 paid	4—4½	..	5 15 7
380,000	Stk.	Aug. 13	12	Brentford Consolidated	228—233	..	5 3 0
300,000	,,	,,	9	Do. New . . .	171—176	..	5 2 3
50,000	,,	,,	5	Do. 5 p.c. Pret. .	130—135	..	3 14 1
206,250	,,	Dec. 11	4	Do. 4 p.c. Deb. .	103—108	..	3 14 1
220,000	Stk.	Sept. 11	10⅝	Brighton & Hove Orig.	207—212	..	5 1 5
246,320	,,	,,	7½	Do. A. Ord. Stk. .	145—150	..	5 3 4
460,000	20	Oct. 15	10	British	38½—39½	..	5 1 3
100,000	Stk.	Aug. 13	6	Bromley, Ord. 5 p.c. .	115—120	..	5 0 0
165,700	,,	,,	4½	Do. do. 3½ p.c. .	88—93	..	4 16 9
500,000	10	Oct. 15	7	Buenos Ayres (New) Ltd	10½—11	..	6 7 3
250,000	Stk.	Dec. 30	4	Do. 4 p.c. Deb.	91—93	..	4 6 0
150,000	20	July 10	8½	Cagliari, Ltd. . . .	22—24	..	6 17 6
100,000	10	June 11	10	Cape Town & Dis., Ltd.	14—15	..	6 13 4
50,000	50	Nov. 3	6	Do. 6 p.c. 1st Mort.	52—54	..	5 11 1
1,375,000	Stk.	Aug. 27	5⅛	Commercial 4 p.c. Stk.	104—107	..	4 17 3
503,750	,,	,,	5	Do. 3½ p.c. do.	99—102	+1	4 18 0
442,947	,,	Dec. 11	3	Do. 3 p.c. Deb. do.	84—87	..	3 9 0
800,000	Stk.	Dec. 30	7	Continental Union, Ltd.	115—120	..	5 16 8
200,000	,,	,,	7	Do. 7 p.c. Pref.	130—135	..	5 3 8
575,000	Stk.	Aug. 27	5⅛	Crystal Palace Ord. 5 p.c.	110—115	..	4 12 9
60,000	,,	,,	5	Do. 5 p.c. Pref. .	118—123	..	4 1 4
112,533	,,	Jan. 14	5	Do. 5 p.c. Deb. Stk.	134—137	..	3 13 10
486,090	10	Jan. 28	10½	European, Ltd. . . .	18—19*	..	5 10 6
354,060	10	,,	10½	Do. £7 10s. paid	13—14*	+½	5 12 6
15,243,200	Stk.	Aug. 13	4⅛	Gas- 4 p.c. Ord. . .	89—91	..	4 16 8
2,600,000	,,	,,	3½	light 3½ p.c. max. .	88—90	..	3 17 9
3,799,735	,,	,,	4	and 4 p.c. Con. Pref.	107—110	..	3 12 9
4,193,975	,,	Dec. 11	3	Coke 3 p.c. Con. Deb.	85—87	..	3 9 0
258,740	Stk.	Sept. 11	5	Hastings & St. L. 3½ p.c.	90—95	..	5 5 3
70,000	10	Oct. 15	11	Hongkong & China, Ltd.	16—17	..	6 9 5
3,800,000	Stk.	Nov. 12	10	Imperial Continental .	198—201	..	4 19 6
473,600	Stk.	Aug. 13	3½	Do. 3½ p.c. Deb. Red.	98—100	..	3 10 0
165,242	Stk.	Aug. 27	6	Lea Bridge Ord. 5 p.c.	113—118	..	5 1 8
561,000	Stk.	,,	10	Liverpool United A .	214—216	..	4 12 7
718,100	,,	,,	7	Do. do. B .	162—164	..	4 5 4
306,083	,,	Dec. 30	4	Do. do. Deb. Stk.	108—110	..	3 12 9
75,000	5	Dec. 11	5	Malta & Medn., Ltd. .	4¼—4⅜	..	5 5 3
560,000	100	Oct. 1	5	Met. of 5 p.c. Deb.	101—105	..	4 15 3
250,000	100	,,	4½	Melbourne 4½ p.c. Deb.	100—102	..	4 8 3
541,920	20	Nov. 12	3½	Monte Video, Ltd. . .	9—10	..	7 0 0
1,315,892	Stk.	Aug. 13	4½	Newc'tle & G'tesh'd Con.	105—107	..	4 4 1
376,855	Stk.	Dec. 31	3½	Do. 3½ p.c. Deb.	94—95	..	3 13 8
300,000	Stk.	Nov. 26	8	Oriental, Ltd. . . .	135—140	..	5 14 4
600,000	5	Sept. 30	7	Ottoman, Ltd. . . .	5—6 Ex div.*	..	5 16 8

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.	GAS COMPANIES.			£ s. d.
205,005	Stk.	Jan. 14	6½	Ply'mth & St'house 5 p.c	121—126	..	4 17 2
851,070	10	Oct. 15	7	River Plate Ord. . .	11—11½	..	6 1 9
300,000	Stk.	Dec. 30	4	Do. 4 p.c. Deb. .	92—94	..	4 5 1
250,000	10	Sept. 30	8	San Paulo, Ltd. . . .	10½—11½	..	6 19 2
135,000	Stk.	Sept. 11	10	Sheffield A	240—242	..	4 2 8
209,984	,,	,,	10	Do. B	240—242	..	4 2 8
523,498	,,	,,	10	Do. C	238—241	−½	4 3 0
116,106	Stk.	Sept. 30	5	Shrewsbury Ord. 5 p.c.	109—112	..	4 9 3
6,150,000	Stk.	Aug. 13	5⅛	South Met., 4 p.c. Ord.	118—121	..	4 8 2
1,780,000	,,	Jan. 14	3	Do. 3 p.c. Deb. . .	84—87	..	3 9 0
380,940	Stk.	Nov. 12	5	Southampton Ord. . .	105—110	..	4 10 11
87,950	,,	Jan. 14	4	Do. 4 p.c. Deb.	100—103	..	3 17 8
120,000	Stk.	Aug. 27	6	Tottenham and Edmonton A. 5 p.c.	115—120	..	5 0 0
313,020	,,	,,	4½	Edmonton B. 3½ p.c.	95—100	..	4 10 0
182,380	10	Dec. 30	8	Tuscan, Ltd.	8—9	..	8 17 10
149,900	10	Jan. 2	5	Do. 5 p.c. Deb. Red.	97—99	..	5 1 0
737,142	Stk.	Aug. 13	5	West Ham, 5 p.c. Ord.	96—99	..	5 1 0
				WATER COMPANIES.			
781,517	Stk.	Dec. 30	12	Chelsea, Ord. . . .	315—325	+5	3 13 10
150,000	,,	,,	5	Do. 5 p.c. Pref. .	142—147	+2	3 8 0
160,000	,,	,,	4½	Do. 4½ p.c. Pref. '75	132—137	+2	3 5 8
175,785	,,	Sept. 30	4½	Do. 4½ p.c. Deb. .	132—137	..	3 5 8
1,720,560	Stk.	Oct. 15	8	East London, Ord. . .	220—225	..	3 11 1
654,740	,,	Dec. 11	4½	Do. 4½ p.c. Deb. .	133—138	..	3 5 3
1,282,943	,,	,,	3	Do. 3 p.c. Deb. .	87—90	..	3 6 8
700,000	50	Dec. 11	10	Grand Junction 10 p.c. max.	135—138	..	3 12 6
310,000	Stk.	Sept. 30	4	Junction 4 p.c. Deb.	115—120	..	3 6 8
708,000	Stk.	Aug. 13	10	Kent	290—300	..	3 6 8
160,000	,,	,,	7	Do. New, 7 p.c. max.	195—205	..	3 8 4
1,043,800	100	Dec. 30	11	Lambeth, 10 p.c. max.	290—300	..	3 13 4
406,200	100	,,	8½	Do. 7½ p.c. max.	215—225	..	3 15 7
350,000	Stk.	Sept. 30	4	Do. 4 p.c. Deb.	115—120	..	3 6 8
500,000	100	Aug. 13	12⅛	New River, New Shares	310—320	..	4 0 0
1,000,000	Stk.	Jan. 28	4	Do. 4 p.c. Deb.	116—119*	+2	3 7 3
902,300	Stk.	Dec. 30	7½	South-wark Ord. . . .	255—265	+10	2 16 7
126,500	100	,,	7½	and 7½ p.c. max.	215—225	+10	3 6 8
489,200	Stk.	,,	5	5 p.c. Pref. .	142—147	..	3 8 0
1,019,585	,,	Oct. 15	4	Vauxhall 4 p.c. A Deb.	115—120	..	3 6 8
1,155,066	Stk.	Dec. 11	10	West Middlesex . . .	290—295	..	3 7 9
200,000	,,	,,	4½	Do. 4½ p.c. Deb. .	130—135	..	3 6 8
900,000	,,	Sept. 11	3	Do. 3 p.c. Deb. .	88—91 * Ex div.	..	3 5 11

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WANTED, at once, a Smart All-round HANDY MAN, used to fitting in compo, brass, or iron. Quick at Slot Work, fixing Meters, Stoves, and Main and Service Laying. Able to do all Repairs on Works, including rough Smith Work, and accurate in reading Meters. Must be reliable and steady. Abstainer preferred. Age about 30. Wages 6d. per hour. References only required. Men not used to above work need not apply.

State Age, and whether Married or Single, to MANAGER, Gas-Works, Paignton, SOUTH DEVON.

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WANTED, for a Gas Company in the North of England, a competent Man as INSPECTOR. He will be required to take the oversight of Gas Fitters, Meter Inspectors, &c.

Applicants must have had Practical Experience of modern Gas-Fitting in all its branches, and be not more than 35 years of Age.

Apply, by letter, giving Experiences and References, and stating Salary required, &c., to No. 4158, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, by a Gas and Water Com- pany in the South of England, a steady and reliable man as WATER INSPECTOR. Must be a good Plumber, with a thorough knowledge of Water Valves, Meters, and Inside House Work (Hot and Cold). Will be required to lay Mains and Services, and, in case of Fire, to attend with Brigade, as Turncock. A man who has had experience with Water Company in distribution preferred. Age not to exceed 40. Wages 35s. per week, and House free.

Applications, with Three *copies* of Testimonials, to be sent in by Feb. 9, to No. 4159, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

METER INSPECTOR.

THE Urban District Council of Ashton- in-Makerfield invite APPLICATIONS for the position of GAS-METER INSPECTOR. Duties to comprise taking state of Ordinary Meters, collection from Automatic Meters, and attending to Meters generally.

Applications to be sent in to the undersigned not later than the 16th of February, 1904, accompanied by *copies* of not more than two recent Testimonials (which will not be returned), stating Age, Wage, and Experience.

Further Information may be had on written Application to Mr. Niven, Gas Manager, at the Gas-Works.

ALBERT SYKES,
Clerk to the Council.

Council Offices, Ashton-in-Makerfield,
Jan. 28, 1904.

HECKMONDWIKE GAS COMPANY.

AN Assistant-Manager wanted for the above Works, making rather over 100 Million cubic feet of gas per Annum.

Candidates must possess a thorough knowledge of Gas Manufacture and Distribution, and be experienced in the working of both Inclined and Horizontal Retorts, with a knowledge of Chemistry and Gas Analysis, the preparation of Drawings and Specifications, and fully qualified to take entire charge of the Works in the absence of the Manager.

Applications, stating Age, Experience, and Salary required, accompanied by *copies* only of not more than three recent Testimonials, and marked on the envelope "Assistant Manager," to be addressed to the Chairman of the Company, as under, not later than Thursday, the 11th of February, 1904.

JOSEPH STEAD,

Ashfield Villa, Heckmondwike.

OXIDE OF IRON.

(NATURAL.)

BALE & CHURCH will be pleased to send Samples and Quotations, and make Offers for SPENT OXIDE.

BALE'S FIRE CEMENT, PAINT, AND GAS COAL,

5, CROOKED LANE, LONDON, E.C.

COAL GAS TAR wanted.

Gas Managers in Gloucester, Somerset, Worcester, Devon, Wilts, Hereford, Monmouth, and Glamorgan PLEASE NOTE. BEST PRICE offered either on Fixed or Sliding-Scale Basis.

State Quantity to offer for Prompt and Forward Delivery.

The SHARPNESS CHEMICAL COMPANY, LIMITED, Tar Distillers, Sharpness Docks, GLOS.

JUNIOR DRAUGHTSMAN.

WANTED, by the Tottenham and Edmonton Gaslight and Coke Company, a JUNIOR DRAUGHTSMAN, who has been trained in the Construction of Gas-Works Plant.

Applicants to state Age, Qualifications, and Salary expected, by letter, to Mr. A. E. BROADBERRY, Engineer and Manager, Gas-Works, TOTTENHAM.

WANTED, Second-hand Gas-Meters, from 2-lights up. State Condition and Price. Any number taken.

Address No. 4156, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

PURIFIERS Wanted. One set each 10 feet, 12 feet, and 14 feet Square Boxes complete.

State Age, Maker, and Condition to FIRTH BLAKELEY AND CO., Thornhill, DEWSBURY.

WANTED, Three Second-Hand Puri FIERS, about 10 feet square, with 8-inch Valves and Connections; also STATION METER, to pass 6000 to 8000 feet per hour.

Prices and Particulars to be sent to the GAS MANAGER, Barrhead, near GLASGOW.

CONDENSER for Sale. In splendid Condition. Cheap. Capacity 250,000 Cubic Feet per Twenty-four hours.

Apply to A. E. LAYTON, Manager, Gas-Works, REDDITCH.

TO BE SOLD — Twin-Cylinder Gas- ENGINE, 6 n.h.p., by Crossley; Cylinders 8 in. diameter by 18 in. stroke, and Gas-Bag.

NEW GASHOLDER SHELLS, 40 feet diameter by 12 feet deep, and 50 feet diameter by 15 feet deep, with or without New Steel Tanks and Standard Guides.

Write J. WRIGHT, 181, Queen Victoria Street, LONDON, E.C.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.

J. F. BLAKELEY, Gas Engineer, Thornhill, DEWSBURY.

FOR SALE, by the Hindley Urban District Council, One 8-inch STATION GOVERNOR (Braddock). In Splendid Condition; taken out to be replaced by a larger size. May be seen by appointment with

H. O. TIMMINS,
Gas Engineer.

Gas-Works, Hindley,
Near Wigan, Jan. 25, 1904.

CRYSTAL PALACE DISTRICT GAS COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors of this Company will be held at the Albion Tavern, Aldersgate Street, London, E.C., on Friday, the 12th day of February, 1904, at Three o'clock in the afternoon precisely, to receive the Report of the Directors and Statement of Accounts for the Half Year ended the 31st of December last, to declare a Dividend for the same period, to elect Two Directors and One Auditor in the place of those retiring by rotation, and for General Purposes.

NOTICE IS HEREBY GIVEN, that an Extraordinary Meeting of the Proprietors of the Crystal Palace District Gas Company will be held at the Albion Tavern, Aldersgate Street, London, E.C., on Friday, the 12th day of February next, at 3.30 o'clock in the afternoon, or as soon thereafter as the business of the Ordinary Meeting of the Proprietors shall be concluded, for the purpose of considering the Provisions of the Bill now before Parliament, intituled "A Bill to alter the Provisions of the Acts of the Crystal Palace District Gas Company with respect to the illuminating power of gas supplied by them and the testing of gas and to change the name of the Company to 'The South Suburban Gas Company,' and for other purposes."

At such Meeting the said Bill will be submitted for the consideration and approval of the Proprietors.

Dated this 29th day of January, 1904.

The TRANSFER BOOKS WILL BE CLOSED from the 29th day of January, until after the Meeting.

By order of the Board,
CHARLES M. OHREN,
Secretary.

Offices and Works:
Lower Sydenham, S.E.,
Jan. 29, 1904.

TAR Contracts Wanted on the Sliding-Scale or at Fixed Prices.

Managers and Secretaries desirous of selling to best advantage please communicate with DENT AND CO., Ouse Chemical Works, SELBY.

COUNTY BOROUGH OF HALIFAX.

THE Gas-Works Committee of the Halifax Corporation invite TENDERS for the purchase of one LANCASHIRE BOILER, 27 ft. long by 7 ft. diameter (3-feet flues), made by the Oldham Boiler Works Company.

The Boiler is in good condition, and complete with all necessary Valves and Fittings. Insurance pressure 100 lbs.

The Boiler may be Inspected, and further Particulars obtained, on application to Mr. J. Wilkinson, F.C.S., Engineer, Gas-Works, Halifax.

Tenders, endorsed "Boiler," must be sent to the undersigned not later than Twelve o'clock noon on Friday, the 12th of February, 1904.

The Committee do not bind themselves to accept the highest or any Tender.

By order,
KEIGHLEY WALTON,
Town Clerk.

HINDLEY URBAN DISTRICT COUNCIL.

GAS-WORKS.

TENDERS are invited for Sulphate of AMMONIA PLANT, capable of producing a Ton of Sulphate per day.

Any further Information may be obtained on Application to Mr. H. O. Timmins, Gas Engineer.

Sealed Tenders, endorsed "Sulphate Plant," addressed to the Chairman of the Gas Committee, to be sent to me not later than Feb. 15, 1904.

The lowest or any Tender not necessarily accepted.

Signed THOS. ROBEY,
Clerk to the Council.

Council Offices: Cross Street,
Hindley, Jan. 29, 1904.

MANCHESTER CORPORATION GAS-WORKS.

TO TAR DISTILLERS AND OTHERS.

THE Gas Committee of the Corporation of Manchester are prepared to receive TENDERS for the purchase and removal, on the Sliding-Scale Basis, of the GAS TAR to be produced at their Bradford Road Station during a period of One, Two, or Three Years, commencing at noon on the 31st of March, 1904.

The Committee reserve the right to divide the Tenders as they may consider advisable.

Sealed Tenders, addressed to the Chairman of the Gas Committee, and endorsed "Tender for Gas Tar," must be delivered at the Offices of the Gas Department, Town Hall, on or before Ten a.m. on Thursday, the 24th day of March, 1904.

Full Particulars and Tender Form may be obtained on application in writing to Mr. Charles Nickson, Superintendent of the Gas Department.

By order of the Gas Committee,
WM. HENRY TALBOT,
Town Clerk.

Town Hall, Manchester,
Jan. 29, 1904.

MANCHESTER CORPORATION GAS-WORKS.

TO TAR DISTILLERS AND OTHERS.

THE Gas Committee of the Corporation of Manchester are prepared to receive TENDERS for the purchase and removal of the TAR to be produced by the Carburetted Water-Gas Plant at their Bradford Road Station during One, Two, or Three Years, commencing at noon on the 31st of March, 1904.

The Committee do not bind themselves to accept the highest or any Tender.

Sealed Tenders, addressed to the Chairman of the Gas Committee, and endorsed "Tender for Carburetted Water-Gas Tar," must be delivered at the Offices of the Gas Department on or before Ten a.m. on Thursday, the 24th day of March, 1904.

Full Particulars and Tender Form may be obtained on application in writing to Mr. Charles Nickson, Superintendent of the Gas Department.

By order of the Gas Committee,
WM. HENRY TALBOT,
Town Clerk.

Town Hall, Manchester,
Jan. 29, 1904.

BARNET DISTRICT GAS AND WATER COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors of the above Company will be held at the Albion Tavern, Aldersgate Street, in the City of London, on Friday, the 19th day of February, 1904, at Twelve o'clock at noon precisely, to receive the Report of the Directors and Accounts for the Half Year ended the 31st day of December last, to declare a Dividend, to elect Directors and an Auditor in the place of those retiring by rotation, and to transact the General Business of the Company.

And NOTICE IS HEREBY FURTHER GIVEN, that, immediately after the conclusion of the business of the above Meeting, an EXTRAORDINARY GENERAL MEETING of the Proprietors of the above Company will, at the same place, and on the same day, be held for the purpose of submitting to the Proprietors at such Meeting a proposed Bill in Parliament to be intituled: "A Bill to enable the Barnet District Gas and Water Company to acquire additional Lands, construct additional Works, and raise further Capital, and for other purposes."

The TRANSFER BOOKS WILL BE CLOSED from the 6th to the 19th of February, both days inclusive.

By order of the Board,
ERNEST W. DREW,
Secretary.

Offices: 30, Gracechurch Street,
London, Jan. 29, 1904.

PONTYPRIDD URBAN DISTRICT COUNCIL.

(GAS DEPARTMENT.)

THE Gas Committee are prepared to receive TENDERS for the supply of GAS-COOKERS for Slot Installations and Hiring Out for the Year ending the 31st of March 1905.

AN EXHIBITION TO BE HELD IN MAY OR JUNE.

Specifications and Forms of Tenders, together with Particulars of the Lighting Section, may be obtained from Mr. Edward Jones, Gas Engineer, Gas Offices, Treforest.

Tenders, sealed and endorsed "Cookers," to be sent to the undersigned not later that Feb. 15, 1904.

J. COLENSO JONES,
Clerk.

Council Chambers, Pontypridd,
Jan. 26, 1904.

BARNSTAPLE GAS COMPANY.

NOTICE is Hereby Given, that the ORDINARY GENERAL MEETING of the Shareholders of the above Company will be held at the Bridge Hall, Barnstaple, on Saturday, the 20th day of February, 1904, at Twelve o'clock noon, to receive the Report of the Directors and the Accounts for the Year ended the 31st day of December last, to declare Dividends, to elect a Director and an Auditor, and to transact the General Business of the Company.

The TRANSFER BOOKS WILL BEC LOSED from the 6th to the 20th of February, both days inclusive.

By order of the Board,
F. L. SCHOFIELD,
Secretary.

Offices: 15, Cross Street, Barnstaple,
Jan. 15, 1904.

COMMERCIAL GAS COMPANY.

NOTICE is Hereby Given, that an ORDINARY MEETING of the Commercial Gas Company will be holden at the Cannon Street Hotel, in the City of London, on Thursday, the 18th of February, 1904, at Twelve o'clock at noon, to receive the Directors' Report and the Accounts of the Company for the Half Year ended the 31st of December, 1903, to declare a Dividend, and to elect Directors and Auditors in place of those retiring.

The STOCK TRANSFER BOOKS WILL BE CLOSED from the 5th to the 18th of February next, both days inclusive, and the Dividends will be paid on the 3rd of March to the holders of Stock registered at the date of the closing.

By order of the Board,
H. D. ELLIS,
Secretary.

Offices: Stepney,
Jan. 28, 1904.

TOTTENHAM AND EDMONTON GASLIGHT AND COKE COMPANY.

NOTICE is Hereby Given, that the HALF-YEARLY ORDINARY GENERAL MEETING of the Proprietors of this Company will be held at the Company's Chief Offices, 639, High Road, Tottenham, on Saturday, the 20th day of February next, at half-past Two o'clock in the afternoon precisely, to receive the Report of the Directors and Statement of Accounts for the Half Year ended the 31st of December, 1903, to declare Dividends, and to consider, in accordance with notice, the question of the remuneration of the Auditors.

The TRANSFER BOOKS for the CONSOLIDATED "A" and "B" STOCKS WILL BE CLOSED from Friday, the 5th, to Monday, the 22nd of February, both days inclusive.

And NOTICE is HEREBY FURTHER GIVEN, that an EXTRAORDINARY GENERAL MEETING of the Proprietors of the Company will be held immediately after the Ordinary Meeting for the purpose of authorizing the issue of the remaining Additional "B" Consolidated Stock (£75,000) and £25,000 Four per cent. Debenture Stock, in accordance with the provisions of the Company's Act 1898.

By order of the Board,
JAMES RANDALL,
Secretary.

Chief Offices: 639, High Road,
Tottenham, Jan. 29, 1904.

ISSUES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS begs to notify that his ISSUES by AUCTION under PARLIAMENTARY POWERS of STOCKS and SHARES in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing such Capital, and also for including Gas and Water Stocks and Shares belonging to Private Owners in these Periodical Sales, can be obtained on application at MR. ALFRED RICHARDS' OFFICES, 18, FINSBURY CIRCUS, E.C.

SUNDERLAND AND SOUTH SHIELDS WATER COMPANY.

IMPORTANT SALE OF WATER STOCK.

TO BE SOLD by Auction, in the Long Room of the Queen's Hotel, Fawcett Street Sunderland, on Thursday, Feb. 25, 1904, at Two o'clock in the afternoon prompt,

MR. ATKINSON GIBSON, AUCTIONEER,

£10,000 (Nominal) of ADDITIONAL ORDINARY CAPITAL STOCK

(Maximum Dividend 5 per cent.), authorized to be created and issued under the powers contained in the Sunderland and South Shields Water Act, 1891.

The above Stock will be entitled to dividend from the 1st day of January, 1904, and be registered in the name of the purchaser *free of charge*.

A deposit of 10 per cent. will be required at the time of Sale; the remainder to be paid on or before the 1st day of March, 1904.

TO CAPITALISTS AND INVESTORS.

ISSUE OF 4 PER CENT. PREFERENCE SHARES IN THE BRECON GAS COMPANY.

MR. HENRY DAVIES is favoured with instructions to SELL by PUBLIC AUCTION, at the Castle Hotel, Brecon, on Wednesday, the 17th day of February, 1904, at Three o'clock p.m. punctually, in lots to suit small Investors,

100 PREFERENCE SHARES OF £10 EACH,

bearing Interest at the rate of Four per cent. per annum, issued under the Brecon Gas Order, 1882.

Particulars and Conditions of Sale may be obtained from Messrs. COBB AND TUDOR, Solicitors; Mr. WILLIAM A. WRIGHT, Secretary; and Mr. HENRY DAVIES, Auctioneer, all of BRECON.

BOURNEMOUTH GAS AND WATER COMPANY.

ISSUE OF £10 SEVEN PER CENT. "B" SHARES.

MINIMUM PRICE OF ISSUE, £15 PER SHARE.

SALE BY TENDER OF 1000 £10 SEVEN PER CENT. "B" SHARES, in pursuance of the Provisions of the Bournemouth Gas and Water Act, 1896.

NOTICE is Hereby Given, that it is the intention of the Directors of this Company to SELL BY TENDER 1000 "B" SHARES OF £10 EACH (the Dividend on which is limited to £7 per cent.), to be paid up in full on or before the 30th of April, 1904.

The Dividend on the Ordinary Shares for the Half Year ended the 30th of June, 1903, was at the rate of 10 per cent. per annum, with an addition at the rate of 3 per cent. per annum under the slidlng-scale, and on the "B" Shares at the rate of 7 per cent. per annum. These dividends have been maintained at the above rates since Dec. 31, 1888.

The net profit earned in the Year ended June 30, 1903, after deducting all charges, including debenture interest, amounted to £29,418 2s 1d., which sum was available for payment of dividends.

During the same Twelve Months, the sum of £2000 was added to reserve fund from profits, and also £703 18s. 2d. from interest on reserve investments, and, after payment of dividends to June 30, 1903, the sum of £6743 6s. 3d. remained to be carried forward to the Half Year ending the 31st of December, 1903.

Particulars and Conditions of Tender may be obtained at the Company's Offices, Bournemouth, or of the Secretary as under.

Sealed Tenders must be sent to the Secretary not later than Eleven o'clock on Thursday morning, the 11th of February, 1904.

By order,
WILLIAM CASH,
Secretary.

London, 90, Cannon Street, E.C.
Jan. 14, 1904.

WREXHAM AND EAST DENBIGHSHIRE WATER COMPANY.

SALE BY TENDER OF £8000 OF ORDINARY STOCK entitled to a Maximum Dividend of 7 per cent. per annum.

LAST DIVIDEND £5 5s. PER CENT.

MINIMUM PRICE OF ISSUE, £125 PER £100.

NOTICE is Hereby Given, that, in ac- cordance with the Provisions of the Wrexham Water Order, 1898, the Directors of the Wrexham and East Denbighshire Water Company intend to SELL BY TENDER EIGHT THOUSAND POUNDS OF ORDINARY STOCK.

The Stock forms part of the Additional Capital created under the Powers of the above-mentioned Order, and will rank for Dividend up to 7 per cent. per annum; being entitled to 7-10ths of that payable on the Consolidated Stock, which at present receives 7½ per cent. per annum.

The Stock will be issued in Lots of £100; and the minimum price, below which no Tender will be considered, is £125. The purchase money to be paid to the Company's Bankers as follows: One-half on the 1st of March, 1904, and the balance on the 1st of June, 1904, or the whole amount may be paid up on the 1st of March.

Copies of the Order may be seen, and further Particulars obtained, at the Company's Offices, 21, Egerton Street, Wrexham.

Tenders, endorsed "Tender for Ordinary Stock," to be sent to the undersigned on or before Monday, the 8th of February.

No special Form of Tender required.

By order of the Directors,
FREDERICK STORR,
Engineer and Secretary.

Water-Works Offices, Wrexham,
Jan. 13, 1904.

N.B.—At £125 per cent. this Stock will bring in an immediate return to the purchaser of £4 4s. per cent., free of Income-Tax.

Now Ready. Price 5s. 6d. Post Free.

REPORTS OF DISTRICT GAS ASSOCIATIONS FOR 1903.

The publication of these Volumes commenced in 1883, and most of them are still on sale.

LONDON:

WALTER KING, 11, Bolt Court, FLEET STREET, E.C.

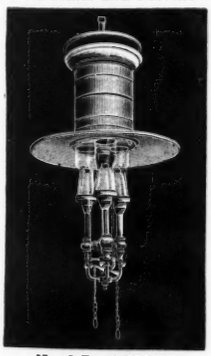
THOMAS DUXBURY & CO.,
16, DEANSGATE, MANCHESTER,
Gas Engineers' Agents and Contractors for
METERS, FIRE-CLAY GOODS, OXIDE OF IRON, AND ALL OTHER GAS APPARATUS.
Inquiries Solicited.
Telegrams: "DARWINIAN, MANCHESTER." Telephone 1806.

NEWBATTLE CANNEL.
Highest Results in Gas, & Excellent Coke.
QUOTATIONS ON APPLICATION TO
THE LOTHIAN COAL COMPANY,
LIMITED,
NEWBATTLE COLLIERIES,
DALKEITH, N.B.

HENRY MILNES,
INGLEBY WORKS,
GIRLINGTON, BRADFORD.
MANUFACTURER OF
HIGH-CLASS LATHES
For Sliding, Surfacing, Screw-cutting, and Plain Turning. Milling Machines, Planing Machines, Slide Rests, Chucks, &c.

Lathes and Tools of my make may be inspected by any intending purchaser at addresses given below.
Agent for Scotland:
THOS. HILL & Co., 66, Robertson Street, Glasgow.
Agent for London: E. PADFIELD & Co., West India House, 96 & 98, Leadenhall Street, London, E.C.

PODMORE & THOMAS'
PATENT
INTENSIFIED SYSTEM
BURNERS
DUST AND INSECT PROOF.
PATENT LAMPS for INTERIOR LIGHTING.
Suitable for
Foundries, Offices, Show-Rooms, Shop Lighting, &c.
Can also be made as Ventilating Lights for Public Halls and Private Rooms.



Can be adjusted to suit any Quality of Gas.
The highest efficiency yet obtained from Low-Pressure Incandescent Gas Lighting without mechanical aid.
No. 6 B. 3-LIGHT.
Our full Catalogue is now ready, illustrating various Designs of our Patent System up to any Power for Private and Public Lighting.
A. E. PODMORE & CO.,
25a, HATTON GARDEN, E.C.
Telephone No. 6600 CENTRAL.
Telegrams: "PROMEROPE, LONDON."

ROBERT MARSHALL,
CANNEL COAL MERCHANT,
97, WELLINGTON STREET, GLASGOW.
Prices and Analysis of all the Scotch Cannels on Application.

THE
PETROLEUM GAS SYNDICATE
Supply and erect Complete Installations of their
PETROGENE PATENT GAS PLANT
On SALE, HIRE, or ROYALTY.
PETROGENE GAS is the most suitable Illuminant for all Towns, Villages, Factories, Institutions, &c., where a Cheap and Efficient Lighting System is required. It is equally suitable for Heating and Power purposes, and may be used with ordinary Gas Fittings, Stoves, Engines, &c. It may also be used in conjunction with Coal Gas, and affords Gas Companies a ready means of increasing their output without the expense of additional storage.
The Syndicate is prepared to entertain offers of sale of small Gas-Works, whether profit earning or not.
Offices: 28, Victoria St., Westminster.
Works: 10, Rochester Row, S.W.

JAMES OAKES & CO.,
ALFRETON IRON-WORKS, DERBYSHIRE,
AND
Wenlock Iron Wharf, 21 & 22, Wharf Road,
CITY ROAD, LONDON, N.,
Manufacture and keep in Stock at their Works (also large stock in London)
PIPES and CONNECTIONS, 1½ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS, and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.
NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with Bolts, Nuts, and Covers, and rendering Leakage impossible.

THE PERFECT MANTLE CO.
1c, Aldgate Avenue, London, E.C.
MANUFACTURERS OF THE WELL-KNOWN
SUPERIOR "PERMCO"
MANTLE, IN COTTON AND RAMIE.

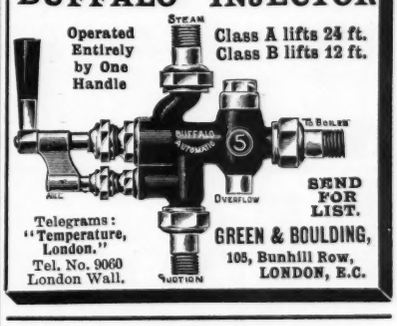
Under Welsbach Licence. Can be used legally with any Burner.
Trade Price 26s. 6d. per Gross.
Reduction for Quantities.

WELDON MUD
FOR
GAS PURIFICATION,
For use in the
RECOVERY OF SULPHUR,
Also Removal of last Traces of
SULPHURETTED HYDROGEN
in catch position.
Full Particulars on application to the Patentees:
GAS DESULPHURIZATION CO.,
— LIMITED, —
1, FENCHURCH AVENUE, LONDON, E.C.

ARMSTRONG'S
PATENT
CANDLE SAFETY LAMPS.
Are a great improvement on Oil, giving a good Light, requiring little or no Cleaning, and when once lighted no further attention is necessary. The Candles are made to burn 5, 7 or 9 hours.
48, MANCHESTER STREET, GRAY'S INN ROAD, W.C.

THE
"ROTARY"
STATION METER.
Efficiency
Demonstrated.
APPLY—
T. G. MARSH,
MAWSON CHAMBERS, DEANSGATE,
MANCHESTER.

'BUFFALO' INJECTOR



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GREEN & BOULDING,
105, Bunhill Row,
LONDON, E.C.

THE PATENT
"BEACON" GLOBE LAMP.

Largely adopted by many Local Authorities for Public Lighting, being absolutely Shadowless and Wind-proof.
H. GREENE & SONS, Limited,
Surrey Engineering Works,
Blackfriars Road, LONDON.
Telephone 1698 HOP.
Telegrams: "LUMINOSITY LONDON."

TROTTER, HAINES, & CORBETT, LIMITED,
Brettell's Estate
FIRE-CLAY & BRICK WORKS,
STOURBRIDGE.

Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.
Special Lumps, Tiles, and Bricks for Regenerative and Furnace Work.
SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

LONDON OFFICE: R. CULL, 34, OLD BROAD STREET, E.C.

HEATHCOTE GAS COAL.
Rich in Illuminating Power and yield of Gas.
Above the Average in Weight and Quality of Coke.
Maintains a High Standard in Residuals.

THE GRASSMOOR CO., LD.,
CHESTERFIELD.

UNEQUALLED.
Gas Companies are solicited to try Samples of the
MIRFIELD
BLACK BED GAS COAL.
Prices and Analysis on application.
MIRFIELD (GAS-COAL) COLLIERY COMPY.
RAVENSTHORPE, NEAR DEWSBURY.

JOHN HALL & CO.,
STOURBRIDGE,
Manufacturers of
FIRE-BRICKS, LUMPS, TILES,
GAS RETORTS,
And every description of Fire-Clay Goods.
RETORTS CAREFULLY PACKED FOR SHIPMENT.

ALEXANDER CAMERON,
GAS AND CANNEL COAL MERCHANT,
48, WEST REGENT STREET,
GLASGOW.

THOMAS TURTON AND SONS, LIMITED,
SHEAF WORKS, SHEFFIELD,
MANUFACTURERS OF
FILES OF BEST QUALITY
FOR ENGINEERS.
STEEL OF ALL DESCRIPTIONS.
SCREW STOCKS, TAPS AND DIES,
SPANNERS, RATCHET BRACES, LIFTING JACKS
ANVILS, VICES,
AND ENGINEERS' TOOLS GENERALLY.
LONDON OFFICE:
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HARRIS & PEARSON,
STOURBRIDGE, ENGLAND,
MANUFACTURERS OF
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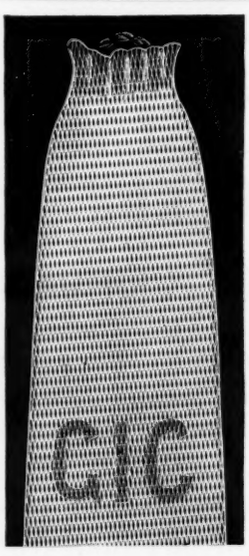

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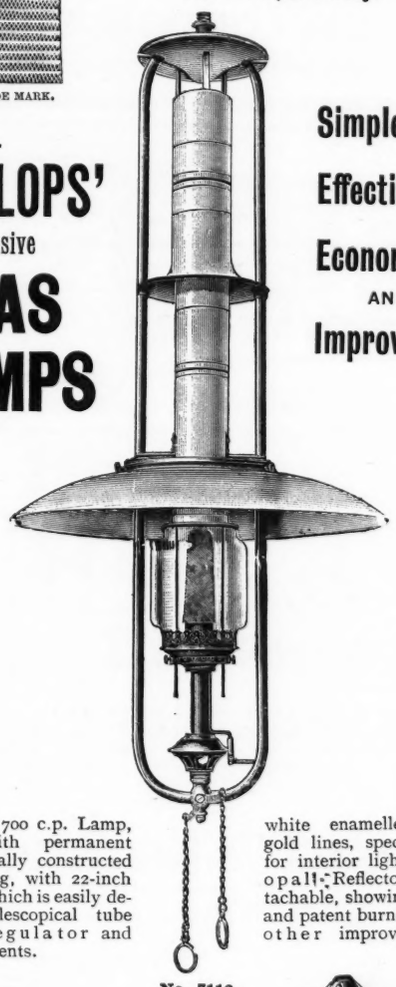

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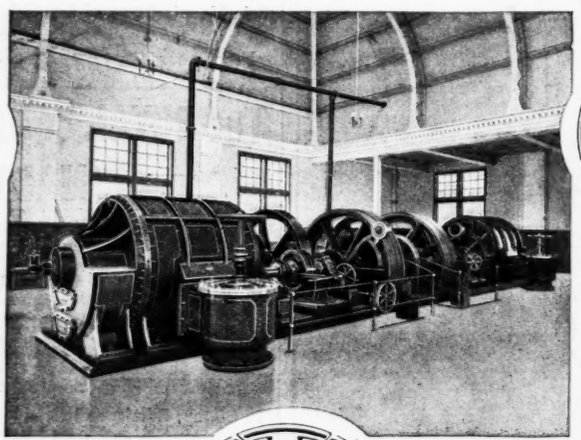

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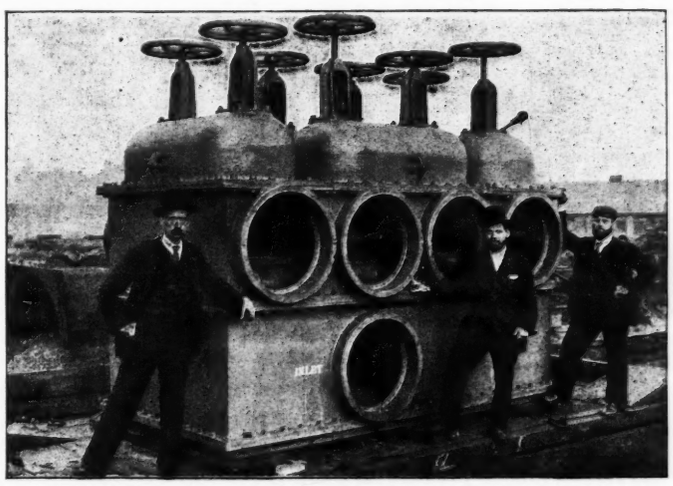

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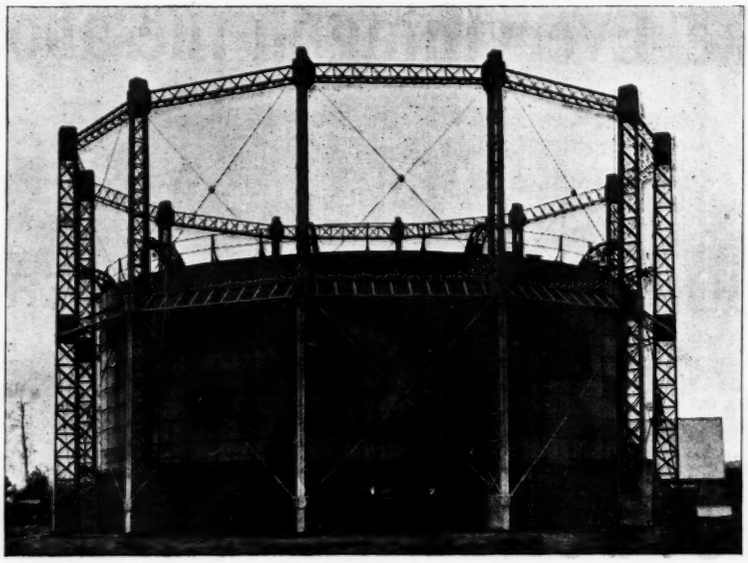

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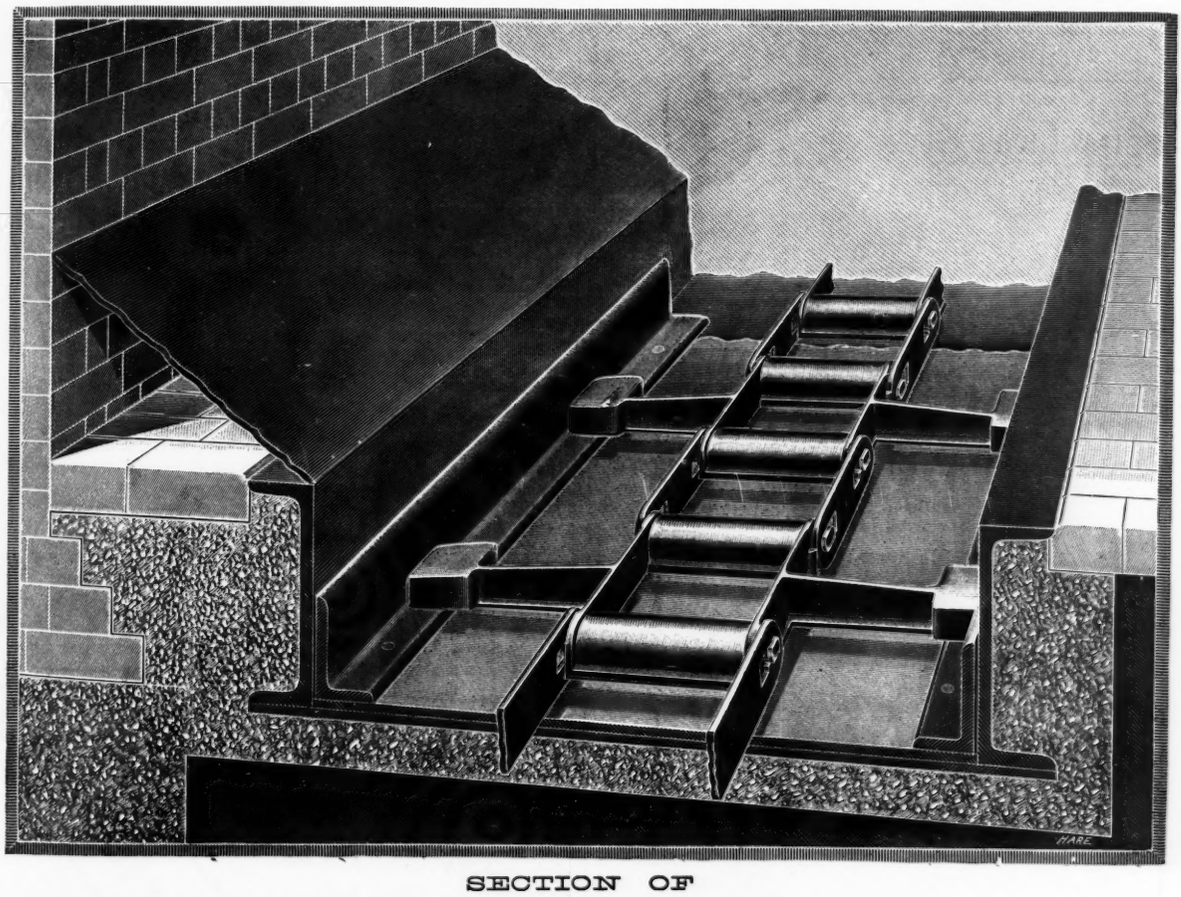

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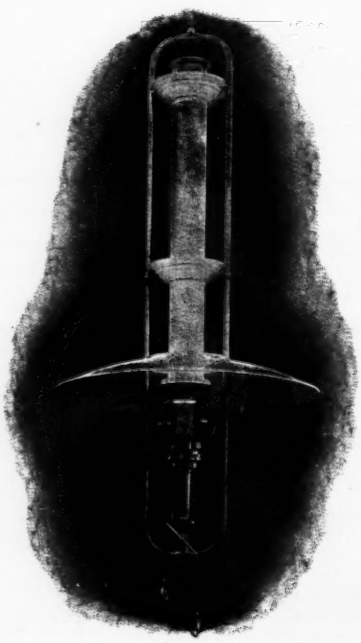

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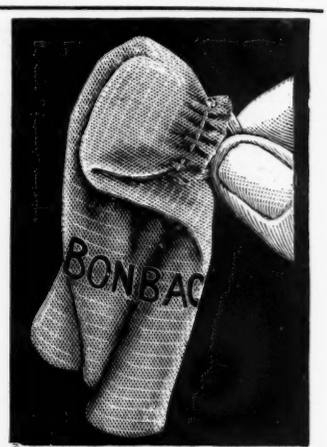

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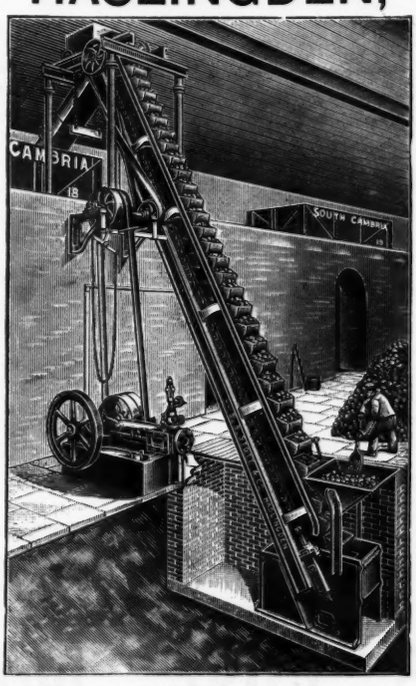

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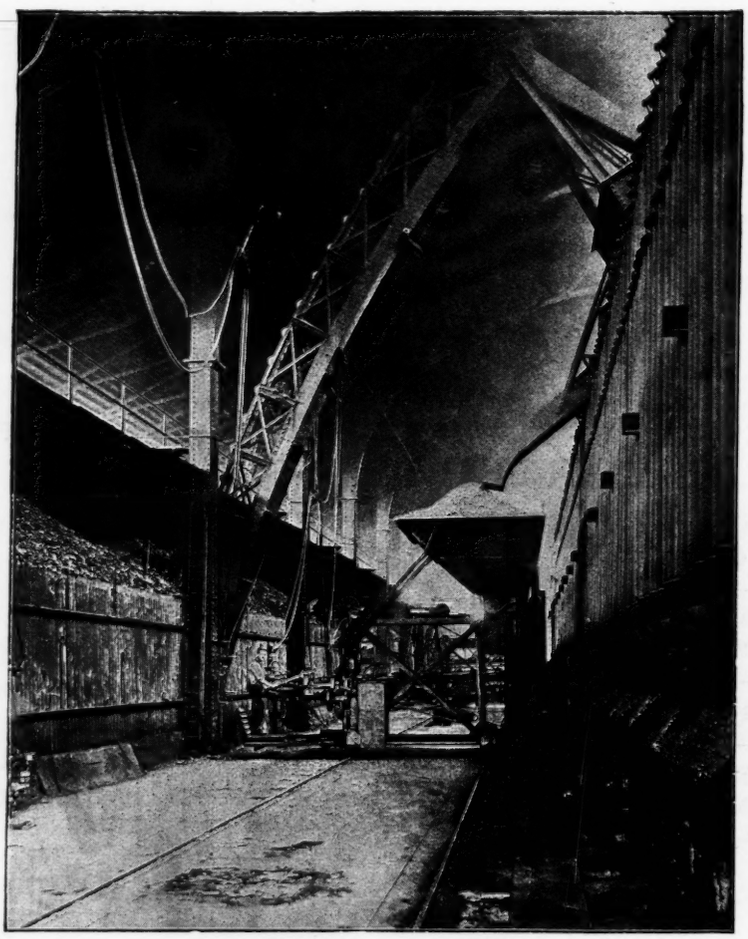

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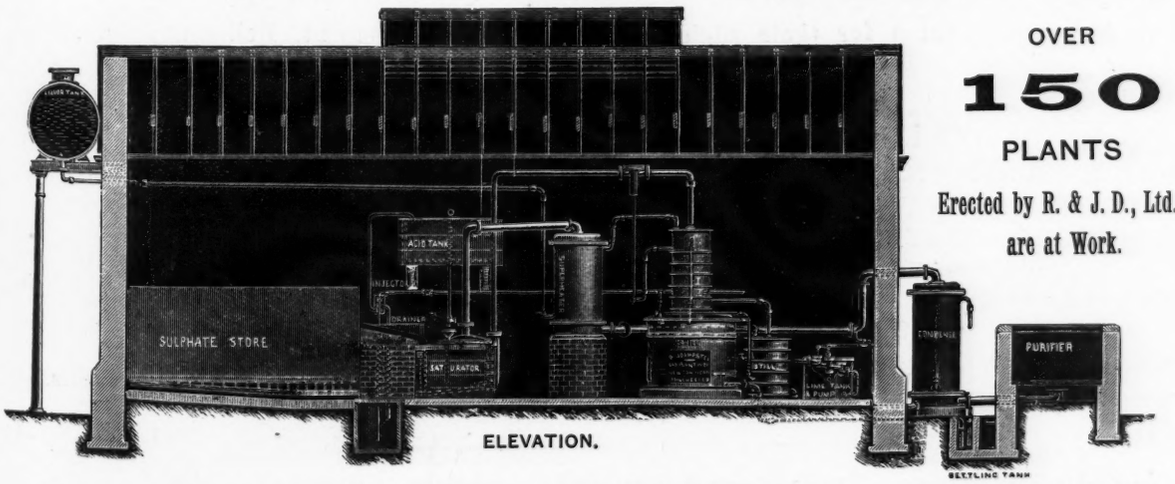

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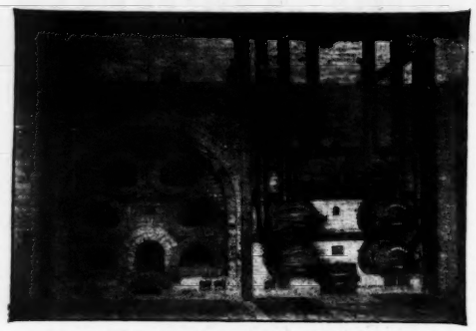

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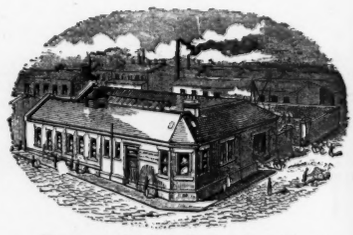

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